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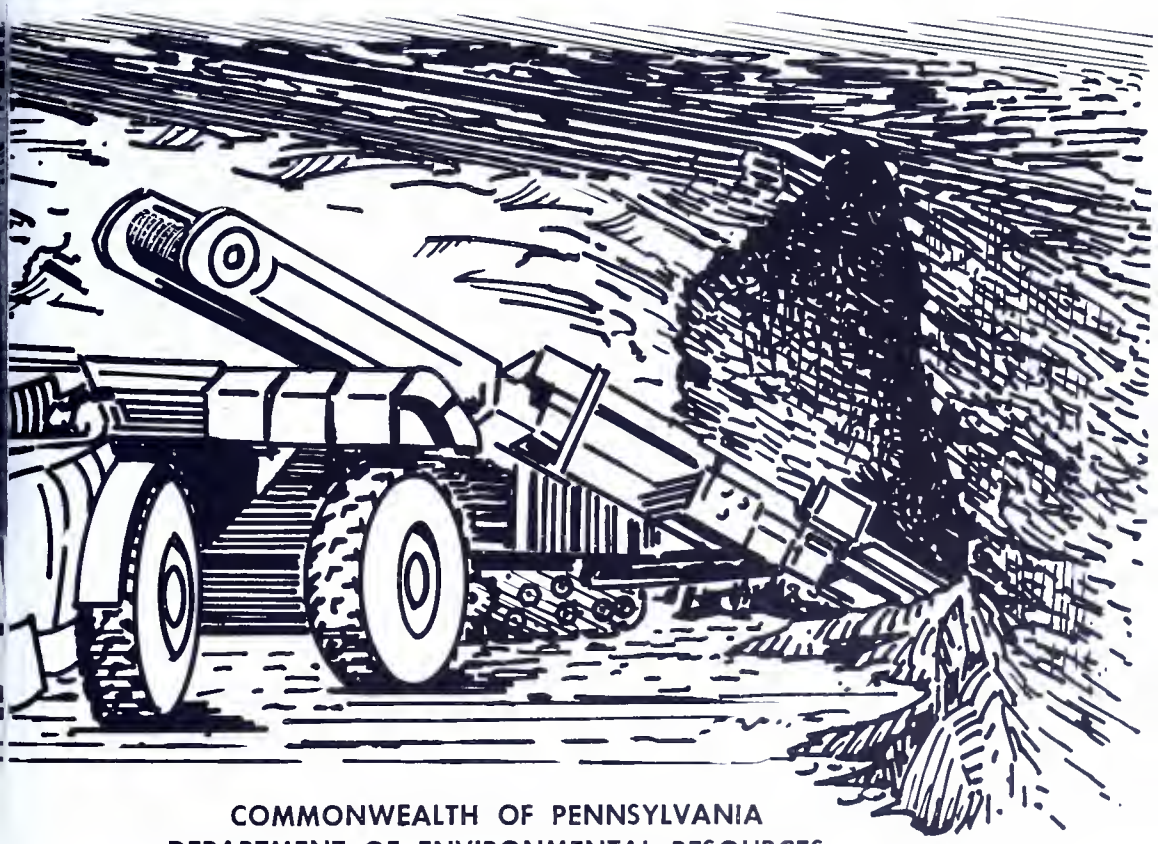
THE MINERAL INDUSTRY OF PENNSYLVANIA IN 1973

nklin D. Cooper



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY
Arthur A. Socolow, State Geologist

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The Mineral Industry of Pennsylvania

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey, Department of Environmental Resources, under a cooperative agreement for collecting information covering mineral production from mines, quarries, and wells.

By Franklin D. Cooper [1]

Pennsylvania mineral production reached record output value of $1,401.9 million, $170.4 million increase above that of 1972 ut only $13.2 million more based on 967 constant dollars. Compared with 972, increases in value were attained by nthracite, bituminous coal, cement, iron re pellets, clays excluding kaolin, lime, atural gas, natural gas liquids, peat, petro-eum (crude), sand and gravel, stone, and nc. The output value of copper decreased, nd the value of gem stones was un-hanged. Compared with the 1972 figures, he average f.o.b. mine value of anthra-te increased $1.22 per ton and that of tuminous coal advanced $1.16 per ton. ollectively, solid-fuels production accounted for 62.5% of the total mineral production value, and the value of all fossil fuels equaled 66.2% of the total mineral production value.

Leading producing counties, with primary commodities in parentheses, were: Washington, Indiana, Greene, Cambria, and Armstrong Counties (bituminous coal); Northampton (cement); Centre (lime); and Schuylkill (anthracite). Pennsylvania led the Nation in production of stone and was second in cement and lime, third in bituminous coal and cadmium, and fourth in tripoli.

[1] Physical scientist, Division of Fossil Fuels—Mineral Supply.

Table 1.—Mineral production in Pennsylvania [1]

Mineral	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)
ement:				
Masonry thousand short tons	451	$12,401	490	$14,443
Portland do	8,214	156,008	8,563	171,653
lays do	2,682	15,829	[2] 2,975	[2] 16,664
oal:				
Anthracite do	7,106	85,251	6,830	90,260
Bituminous do	75,939	694,267	76,403	786,792
opper (recoverable content of ores, etc.) short tons	2,611	2,673	1,845	2,195
em stones	NA	9	NA	9
ime thousand short tons	1,891	33,802	2,260	40,949
ica, scrap thousand long tons	W	W	--	--
atural gas million cubic feet	73,958	22,389	78,514	32,976
eat thousand short tons	22	320	28	411
etroleum (crude) thousand 42-gallon barrels	3,441	16,414	3,282	18,440
and and gravel thousand thousand short tons	18,757	36,804	20,576	42,830
one do	67,307	124,340	78,564	150,346
inc (recoverable content of ores, etc.) short tons	18,344	6,512	18,857	7,792
alue of items that cannot be disclosed: Clay (kaolin) (1973), iron ore, natural gas liquids, tripoli, and values indicated by symbol W	XX	24,466	XX	26,140
Total	XX	1,231,485	XX	1,401,900
Total 1967 constant dollars	XX	1,016,098	XX	[p] 1,029,275

[p] Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Pennsylvania, by county [1 2]

(Thousands)

County	1972	1973	Minerals produced in 1973 in order of valu
Adams	W	W	Stone, lime, clays.
Allegheny	$60,548	$69,481	Coal, cement, stone, petroleum, clays, sand and gravel.
Armstrong	58,365	59,184	Coal, sand and gravel, clays, stone, petroleum.
Beaver	3,689	W	Sand and gravel, coal, clays, petroleum.
Bedford	W	1,862	Stone, sand and gravel.
Berks	35,241	40,951	Iron ore, cement, stone, clays, coal, sand and gravel.
Blair	W	W	Stone, coal, sand and gravel.
Bradford	W	W	Sand and gravel.
Bucks	13,628	17,471	Stone, sand and gravel, clays.
Butler	25,870	W	Coal, cement, lime, stone, sand and gravel, petroleum, clays.
Cambria	W	W	Coal, stone.
Carbon	W	3,492	Coal, sand and gravel, stone.
Centre	20,859	W	Lime, coal, stone, clays.
Chester	W	W	Stone, lime, clays.
Clarion	W	37,481	Coal, stone, petroleum, clays, sand and gravel.
Clearfield	47,716	57,277	Coal, clays.
Clinton	W	W	Coal, stone, clays.
Columbia	W	W	Sand and gravel, stone, coal, peat.
Crawford	555	1,339	Sand and gravel, petroleum.
Cumberland	W	4,255	Stone, sand and gravel, clays.
Dauphin	W	W	Stone, coal, sand and gravel.
Delaware	W	W	Stone.
Elk	W	W	Coal, petroleum, natural gas liquids, stone.
Erie	W	2,146	Sand and gravel, peat, petroleum.
Fayette	18,468	22,712	Coal, stone, clays, petroleum.
Forest	W	W	Petroleum, sand and gravel.
Franklin	W	W	Stone, sand and gravel.
Fulton	535	W	Do.
Greene	100,067	112,527	Coal, petroleum, stone.
Huntingdon	W	W	Sand and gravel, stone, clays.
Indiana	72,629	88,032	Coal.
Jefferson	W	W	Coal, clays, petroleum.
Juanita	366	432	Stone.
Lackawanna	4,848	W	Coal, stone, peat.
Lancaster	W	14,843	Coal, stone, sand and gravel, clays.
Lawrence	33,367	W	Cement, coal, stone, sand and gravel, clays, peat.
Lebanon	17,040	W	Lime, iron ore, copper, stone.
Lehigh	28,226	W	Cement, stone.
Luzerne	31,059	32,922	Coal, stone, sand and gravel, clays, peat.
Lycoming	4,182	5,015	Sand and gravel, stone, coal, tripoli.
McKean	W	W	Petroleum, clays, stone.
Mercer	3,512	W	Coal, sand and gravel, stone, petroleum.
Mifflin	W	W	Sand and gravel, stone.
Monroe	W	2,359	Stone, sand and gravel, clays, peat.
Montgomery	W	W	Stone, cement, lime, clays.
Montour	W	W	Stone.
Northampton	84,217	95,514	Cement, stone, sand and gravel.
Northumberland	W	W	Coal, stone, sand and gravel, clays.
Perry	W	W	Stone.
Philadelphia	--	--	
Pike	-	518	Sand and gravel.
Potter	29	W	Petroleum, stone.
Schuylkill	W	W	Coal, stone, sand and gravel, clays.
Snyder	W	W	Stone, coal.
Somerset	28,503	42,296	Coal, stone, clays, sand and gravel.
Sullivan	581	381	Coal.
Susquehanna	661	739	Stone, coal.
Tioga	W	3,130	Coal, sand and gravel.
Union	W	W	Stone, clays.
Venango	W	W	Petroleum, coal, sand and gravel, natural gas liquids.
Warren	1,261	3,430	Petroleum, sand and gravel.
Washington	W	W	Coal, petroleum, stone, clays.
Wayne	W	W	Stone, sand and gravel.
Westmoreland	29,369	W	Coal, stone, sand and gravel.
Wyoming	W	W	Sand and gravel.
York	28,994	31,305	Cement, stone, lime, clays, sand and gravel.
Undistributed [3]	477,102	650,804	
Total [4]	1,231,485	1,401,900	

W Withheld to avoid disclosing individual company confidential data; included with "U distributed."

[1] Cameron County is not listed because no production was reported.

[2] Value of petroleum is based on an average price per barrel for the State.

[3] Includes some stone and petroleum that cannot be assigned to specific counties, natural ga gem stones, and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Pennsylvania business activity

		1972	1973 [p]	Change, percent
mployment and labor force, annual average:				
Total labor force	thousands	4,899.0	5,010.2	+2.3
Unemployment	do	265.0	242.2	−8.6
Employment (nonagricultural):				
Manufacturing	do	1,433.6	1,475.6	+2.9
Construction	do	205.1	212.6	+3.7
Mining	do	40.0	39.7	−.8
Transportation and public utilities	do	264.2	267.1	+1.1
Wholesale and retail trade	do	862.6	886.2	+2.7
Finance, insurance, and real estate	do	201.1	205.5	+2.2
Services	do	717.5	742.4	+3.5
Government	do	651.4	651.0	−.1
ersonal income:				
Total	millions	$53,249	$58,252	+9.4
Per capita		$4,465	$4,894	+9.6
onstruction activity:				
Value of authorized nonresidential construction	millions	$464.5	$506.5	+9.0
Number of new residential units authorized		63,449	55,214	−13.0
Cement shipments to and within Pennsylvania	thousand short tons	3,428	3,666	+6.9
ineral production value	millions	$1,231.5	$1,401.9	+13.8

[p] Preliminary.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area rends in Employment and Unemployment; U.S. Bureau of Mines.

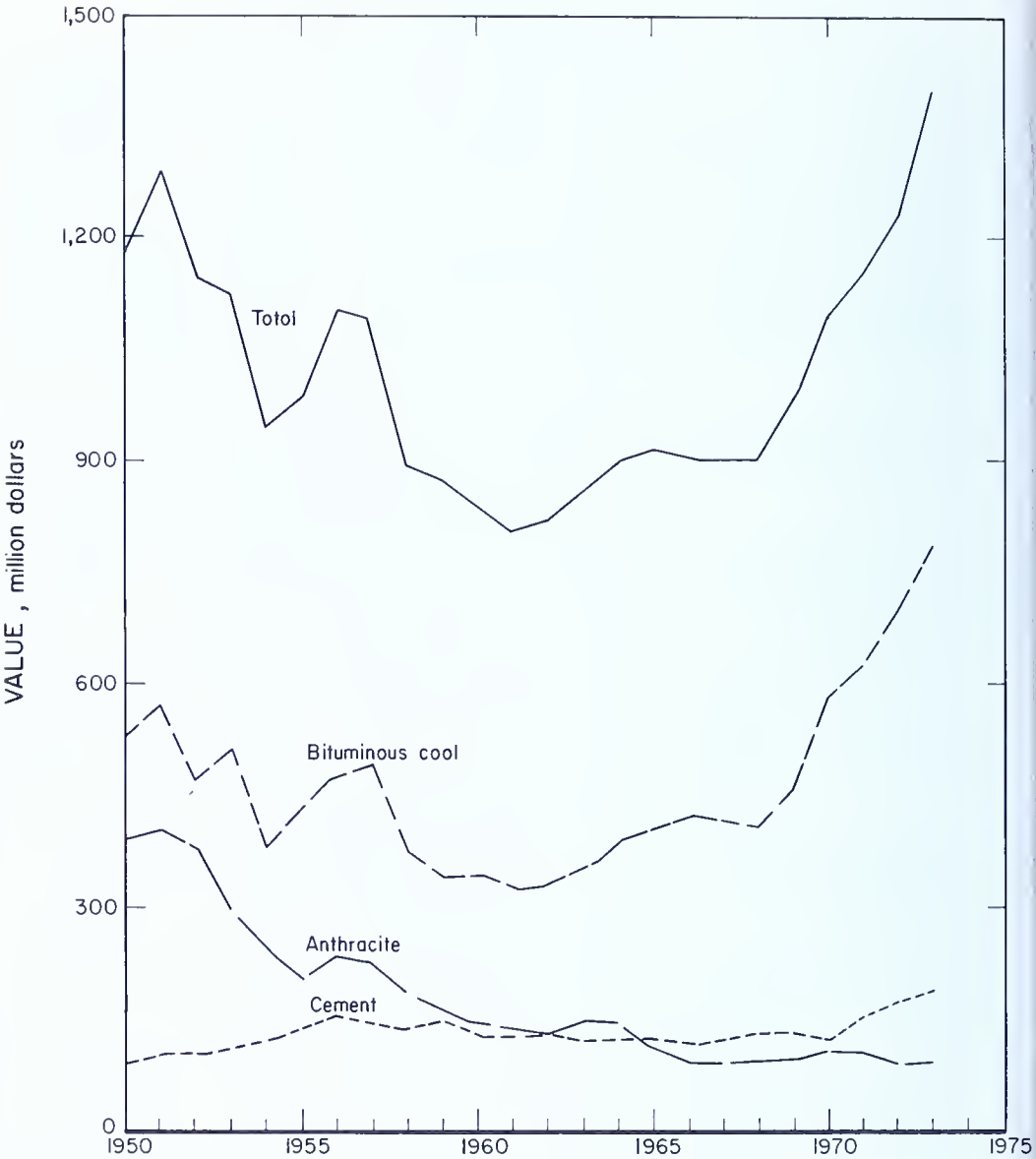

Figure 1.—Value of bituminous coal, anthracite, cement, and total value of mineral pro duction in Pennsylvania.

Legislation and Government Programs.—Act 10A, for appropriating moneys in the Land and Water Development Fund which were derived from the issuance and sale of bonds and notes pursuant to the "Land and Water Conservation and Reclamation Act", was passed by the General Assembly and signed into law during 1973.

The Bureau of Mines awarded $1.5 million in contracts for the rehabilitation of its experimental mine in Bruceton. Work performed there by McCarthy Engineering and Construction, Inc., Tulsa, Okla., included the installation of advanced-type rock anchors, the removal of several thou sand cubic yards of broken rock by pneumatic conveying system, the construc tion of bulkheads, the installation o fibrous concrete on roof and walls, an instrumentation for monitoring simulate coal dust explosions. Other contracts wer with the North American Galis Co. o Blairsville including a $90,000 "stretc car"—a multipurpose mine vehicle capabl of being expanded or contracted hydrau lically—and $240,000 to develop a machin for supporting mine roof with wire-rop trusses. Bituminous Coal Research, Inc

(BCR), Monroeville, was granted $21,696 for a report on the use of water-flushed bits on coal-cutting machinery to minimize the dispersion of respirable dust. The report summarized 146 projects grouped into categories comprising dust control, machine design, respiratory protection, sampling instrumentation, dust physics, dust analysis, mining technology, epidemiological study, and research and facility development.

The Bureau of Mines granted $140,000 to Lehigh University for a 3-year project to design more effective coal dust samplers and to determine if the finest dust particles were accurately detected by sampling devices presently in use.

From 70% to 90% of the pyritic sulfur content was removed in pilot plant tests by the Bureau of Mines on several Pennsylvania coals. Organic sulfur was not removed in the two-stage flotation process used.

Ground breaking ceremonies were held February 6 at Bruceton for the Bureau of Mines 75-ton-per-hour Synthane coal gasification, pilot plant. Rust Engineering Co., on a $9,650,000 contract awarded January 11, will supply the detailed engineering, procurement, and construction efforts. The plant is designed to demonstrate the manufacture of pipeline-quality synthetic natural gas from all ranks of coal, including caking varieties, using a patented coal pretreatment step. Completion was slated for August 1974.

On January 15, the Office of Coal Research (OCR) of the U.S. Department of the Interior awarded a contract for $8,194,000 to Westinghouse Electric Corp. for the first phase of a project to develop at Waltz Mills a system for converting coal to a nonpolluting fuel gas. The program will be carried on by OCR, Westinghouse, Public Service of Indiana, Bechtel Corp., Amax Coal Co., and Peabody Coal Co. Pennslyvania Power and Light Co. (PPL) and Columbus and Southern Ohio Electric Co. (CSOE) also participated in the funding. OCR will assume 70% of the research and development costs. The industry team will bear the rest of the cost and also the full cost of a combined-cycle-power generating plant. After proving the feasibility of the interim powerplant, a gasifier and an electricity generating plant will be constructed by 1978 to be operated by Public Service of Indiana at Dresser, Ind. to produce enough gas for turbines capable of generating 100 to 130 megawatts (MW) of electricity. OCR awarded a $94,853 contract to General Electric Co. (GE) to improve the high-temperature operations of advanced magnetohydrodynamic (MHD) systems for generating electricity from coal. GE will provide an additional $133,000 for the experimental work to be performed over a 14-month period at its Space Sciences Laboratory at Valley Forge.

The University of Pittsburgh on a $103,000 Federal grant was investigating the safe removal of methane during coal mining and possible techniques for its recovery.

In 1973 Pennsylvania State University (Penn State) was spending about $1.8 million in grants for coal research, which were about 75% Federally funded. Penn State, on a project supported by the National Science Foundation's (NSF) Research Applied to National Needs (RANN) program, determined the dissipation of industrial waste heat by municipal waste water. Fields were soaked with sewage effluent; then water, at the temperature of coolant water discharged from a typical electric powerplant, was pumped through pipes buried in the moist soil. For 12 years, Penn State has studied the spray irrigation of sewage effluent in a project called "Living Filter." NSF made a grant to Penn State to improve the technology of coal liquefaction to produce a low-sulfur-content product resembling No. 6 fuel oil.

Pursuant to the Appalachian Regional Development Act of 1965, as amended, eight mine-fire-control projects were underway during 1973. One costing $50,502 was started and completed in Allegheny County, one costing $63,223 was in progress in Washington County, one costing $77,210 was completed in Indiana County, and four costing $3,769,351 were completed in Luzerne County. The 2-year maintenance period for two fire control projects in Westmoreland County was also completed. Three subsidence control projects costing $10,786,682 were started in Lackawanna County, and one subsidence project costing $532,212 was started and completed in Luzerne County. One mine-refuse-bank reclamation project costing $62,532 was started and completed in Lackawanna County. No work was started, in progress, or completed on well sealing

or mine pollution control. All of the active projects had 75% Federal funding and 25% State funding. Work funded equally by Federal and state governments under Public Law 162, Phase D, Project No. 46 was started in the Western Middle anthracite field on mine-water monitoring stations at an estimated total cost of $250,000.

The Department of the Interior in August approved the first mine-refuse-bank-reclamation project under the Appalachian Regional Development Act. The joint Federal-State project will reclaim a total of 33.0 acres at two municipally owned sites. The Bureau of Mines supervised the leveling of about 250,000 cubic yards of burned-out mine waste to reclaim the acreage for industrial development.

In February, the Department of the Interior approved a Federal-State project to control mine subsidence threatening $29 million of property in Scranton. The work, by a private contracting firm, required the hydraulic injection of approximately 1 million cubic yards of crushed mine and preparation plant waste through boreholes into the abandoned Pine Brook mine.

During the year, the DER received bids for the following Appalachian Regional Council (ARC) mine flushing projects: The National Colliery mine at Minooka in the Big, New County, Clark, No. 1 Dunmore, and No. 2 Dunmore veins; the Pine Brook mine in Scranton; and the Top Clark, Bottom Clark, and Third veins of the Powderly colliery in Carbondale. The Minooka project, considered as a pilot demonstration project, was eligible to receive funds from the Bureau of Mines totaling about 60% of the estimated $8 million total cost for drilling boreholes, furnishing and installing casing pipe, and pressure flushing 190,000 tons of breaker refuse into the voids. The Pine Brook project required drilling, the installation of various diameters of pipe casing, the flushing of 1,694,000 tons of processed refuse solids into the voids, and the construction of 17,124 square feet of bulkheads in the mine-void area. The Carbondale project required the flushing of 250,000 tons of refuse material using a controlled method of flushing and an additional 250,000 tons of refuse material flushed by the blind method if it was not possible to use the controlled flushing method for the entire 500,000 tons.

On February 6, Federal and Sta officials assessed the extent of curre fires in those strip-mined pits in th Wyoming Valley that were used as floo debris disposal sites following Hurrica Agnes. Proposals were tentatively devise for fighting a known fire in Wilkes-Bar Township and other reported fires. Th Bureau of Mines made infrared scannin surveys followed by ground inspectio One fire near Plymouth and a secon near the Veterans' Hospital were lat extinguished.

In early October the Economic Develo ment Council of Northeastern Pennsylvani (EDCNP) was designated by the AR as a mine subsidence research center f the region comprising northeastern Pen sylvania. EDCNP will be responsible f the free flow of information among cor sultants, labor, mine owners, governmer officials, and the public; it will provid staff support in all areas of mining-relate problems; and it will assist DER an consultants in obtaining needed advice an information.

The Bureau of Mines prepared pre liminary plans for isolating fires in th Glen Burn culm bank at Shamokin afte locating the fires by infrared imagery. I late September DER submitted a proposa to ARC for extinguishing the fires.

On March 6, DER received bids fro six contractors for exploratory drilling t the Hillman vein at the abandoned Balti more Colliery of the Hudson Coal Co near Wilkes-Barre. The Empire Contractin Co. of Old Forge submitted an apparen low bid of $18,352. On the same dat DER received bids from seven contractor for exploratory drilling at the abandone No. 9 colliery in Pittston. Silver Broo Anthracite, Inc., submitted the lowest bi at $54,940 for drilling to the Checker an Pittston veins to determine the extent o subsidence.

Table 4 summarizes four categories o Operation Scarlift projects completed i the 5-year period ending December 31 1973.

Table 5 lists the Appalachian project approved for Pennsylvania during 1973 i fields related to mining.

Table 6 lists the mineral-industry-oriented Pennsylvania Industrial Development Authority (PIDA) loans approved in 1973.

Table 7 lists the mineral-industry-oriented PIDA loans pending final approval as of December 31, 1973.

Table 4.—Pennsylvania: Operation Scarlift: Summary of the projects completed in the 5-year period ending December 31, 1973

Project category	Anthracite		Bituminous		Total	
	Number	Cost	Number	Cost	Number	Cost
Stream pollution abatement	30	$7,718,128	125	$15,069,160	155	$22,787,288
Air pollution	11	12,281,786	8	181,012	19	12,462,798
Underground mine fires	5	74,030	27	8,918,634	32	8,992,664
Subsidence	11	1,088,974	35	1,633,459	46	2,722,433
Total	57	$21,162,918	195	25,802,265	252	46,965,183

Source: Resources Management, Pennsylvania Department of Environmental Resources Bond Issue Report for Period Ending December 1973, p. 91.

Table 5.—Appalachian projects approved for Pennsylvania in fields related to mining

Project	County	Total cost of project	ARC funds	State funds
Oregon-Welch Hill Section Emergency Subsidence	Luzerne	$4,400,000	$3,300,000	$1,100,000
Swoyersville Emergency Subsidence	do	2,750,000	2,062,500	687,500
Plymouth Emergency Subsidence	do	3,300,000	2,475,000	825,000
Mt. Carmel Emergency Subsidence Project	Northumberland	220,000	165,000	55,000
Total		10,670,000	8,002,500	2,667,500

Source: Bureau of Appalachian Development, Department of Commerce. Commonwealth of Pennsylvania.

Table 6.—Pennsylvania: Mineral-industry oriented PIDA loan projects approved, 1973

SIC code	Industry group	Number of projects	Loans, amount	Project cost	Planned employment	Estimated payroll [1]
32	Stone, clay, glass, concrete	4	$1,318,780	$3,296,950	264	$2,877,490
33	Primary metals	6	2,864,480	7,161,200	590	6,228,320
34	Fabricated metal products	11	980,100	2,284,000	258	3,093,391
35	Machinery, other than electrical	8	2,299,240	6,821,412	650	5,880,904
36	Electrical machinery, equipment, and supplies	5	1,094,022	2,797,555	644	3,552,800
37	Transportation equipment	5	2,840,000	8,550,000	2,244	9,846,000
65	Land development for industrial parks	1	728,390	5,402,000	NA	NA
89	Research and development	1	531,900	1,182,000	275	1,785,000
	Total	41	12,656,912	37,495,117	4,925	33,263,905

NA Not availabble.
[1] Payroll for industry groups are total of project estimates at the time loans were approved; they do not reflect current earnings rates or actual company payrolls for 1973.

Source: Pennsylvania Industrial Development Authority. Summary of Loan Projects 1956–1972. Report 34, p. v. Pennsylvania Industrial Development Authority. Summary of Loan Projects 1956–1973. Report 36, p. 15.

Table 7.—Pennsylvania: Mineral-industry oriented PIDA loan projects tentatively approved pending final approval as of December 31, 1973

SIC code	Industry group	Number of projects	Loans, amount	Project cost	Planned employment	Estimated payroll
32	Stone, clay, glass, concrete products	3	$1,872,696	$4,293,916	143	$1,419,830
33	Primary metals	4	4,627,062	11,567,655	1,014	8,066,000
34	Fabricated metal products	5	302,080	760,200	111	811,380
35	Machinery, other than electrical	9	867,500	2,345,000	258	2,156,692
36	Electrical machinery, equipment and supplies	7	7,281,300	24,000,000	2,159	26,721,271
37	Transportation equipment	2	180,000	486,000	220	1,250,000
65	Land development for industrial parks	7	1,735,536	5,525,486	NA	NA
	Total	37	16,886,174	48,978,257	3,905	40,425,173

NA Not available.

Source: Pennsylvania Industrial Development Authority. Summary of Loan Projects 1956–1973. Report 36, p. 17.

According to the Federal Highway Administration (FHA), the total cost of projects in progress or authorized for the Interstate and Defense Highway system in Pennsylvania at yearend equaled $1,009.9 million, $24.4 million more than at yearend 1972. Projects in progress or authorized at the end of 1973 for primary, secondary, and urban highway extensions totaled $530.6 million, $13.0 million more than at yearend 1972. The total cost of primary, secondary, and urban highway extensions completed in 1973 was $97.5 million. Interstate and Defense Highway mileage opened to traffic in 1973 totaled 0.58 mile, increasing the length of such highway opened to traffic since July 1, 1956 to 1,411.01 miles; at yearend 75.26 miles were under construction; 67.56 miles were in the design stage; and 21.07 miles were in the preliminary status or not yet in progress.

In 1973, DOT awarded contracts totaling $393.7 million including $34.8 million to repair flood damages which resulted from Hurricane Agnes. Construction contract expenditures for 1973 totaled $341.1 million distributed as follows: Interstate system, $101.6 million; primary, $33.1 million; secondary, $14.9 million; urban $36.9 million; Appalachian $38.8 million; 100% State, $98.7 million; and flood, $17.1 million. Total construction expenditures were $20.6 million greater than in 1972. Highway maintenance expenditures, including snow and ice removal, totaled $178.7 million.

As of January 1, 1974, DOT had 750 active construction contracts with a total value of $1,702,715,813. At the start of 1973, there were 605 contracts with a total value of $1,634,591,513.

Three Bureau of Mines publications were released in 1973 that discuss problems relating to the mineral industry of Pennsylvania.[2]

The U.S. Geological Survey issued two publications that contain information on Pennsylvania.[3]

Four publications were released in 1973 by the Pennsylvania Bureau of Topographic and Geologic Survey.[4]

The Pennsylvania Bureau of Topographic and Geologic Survey, in cooperation with the U.S. Geological Survey and the U.S. Bureau of Mines, placed on open file physical and chemical data for 162 clay-shale samples in the Greater Pittsburgh region. The report also suggeste potential uses for the materials.

The Pennsylvania Bureau of Topographi and Geologic Survey, in cooperation wit the U.S. Geological Survey, placed on ope file a detailed report on sources of cor struction aggregates in the Greater Pitt burgh area. Active producers of sand an gravel, crushed stone, and slag are ident fied, and information on geological form tions, physical tests, and current uses c aggregates from each active operation given.

Penn State, under contracts with OCR prepared three reports that were release in 1973. One 134-page report analyze strip-mining methods and equipment selec tion, suggests strip-mining methods fo future application, recommends soun reclamation practices on disturbed lanc and described how the selection of equip ment is strongly influenced by geologica factors as well as the establishment c vegetation on overburden spoil. A secon report summarizes the content of 8 majo metallic elements and 22 trace metalli elements in the ashes of 57 coal an lignite samples. A third report describe the testing of a wide range of coals fo acetylene production. Of 30 samples o coals of various origins and composition studied, the highest yields of acetylen were obtained from high-volatile bitumi nous coals.

In January, Governor Shapp ordered a

[2] Manning, R. E. Muffler for Pneumatic Drill BuMines Open File Rept. 28–73 prepared by U.S.S Engineers and Consultants, Inc., January 24, 1973 24 pp; available for consultation at the Bureau o Mines libraries at Pittsburgh, Pa., Denver, Colo. Twin Cities, Minn., and Spokane, Wash., and a the Central Library. U.S. Department of the In terior, Washington D.C.

McCullock, C.M., and M. Deul. Geologic Fac tors Causing Roof Instability and Methane Emis sion Problems. BuMines RI 7769, 1973, 25 pp.

U.S. Bureau of Mines. Methods and Costs o Coal Refuse Disposal and Reclamation. BuMine IC 8576, 1973, 36 pp.

[3] Brobst, D. H., W. P. Pratt, and D. E. Mc Kelvey. Summary of the U.S. Mineral Resources U.S. Geol. Survey Circ. 682, 1973, 19 pp.

U.S. Geological Survey. United States Minera Resources. Prof. Paper 820, 1973, 722 pp.

[4] Hoskins, D. M. Fossil Collecting in Pennsyl vania. Bull. G–40 (reprint), 1973, available from the Pennsylania Bureau of Publications, P.O. Box 1365 Harrisburg, Pa.

Lytle, W. S. Oil and Gas Developments in Penn sylvania in 1972. Pa. Geol. Survey Progress Rept 186, 1973, 36 pp.

Rudd, N. Subsurface Liquid Waste Disposal and Its Feasibility. Geol. Survey Environmental Geol Rept. 3, 1973.

Sponseller, R. D. Analyses and Measured Sections of Pennsylvania Bituminous Coals. Pennsylvania Geol. Survey Mineral Resources Report 66, 1973. 478 pp.

additional $250,000 in the next State budget for accelerated research on coal conservation, coal use, and coal transportation.

The Governor sponsored the Pennsylvania Industrial Fuel Energy Seminar held in Harrisburg August 22. Cosponsors were the Pennsylvania Coal Mining Association, Keystone Bituminous Coal Association, Associated Petroleum Industries of Pennsylvania, Pennsylvania Electric Association, Pennsylvania Gas Association, and Pennsylvania Petroleum Association. Attendance at the seminar represented, in aggregate, over 40% of the State's total energy demand. Industrial spokesmen contributed their knowledge and understanding of the fuels situation and suggested ways to conserve domestic and industrial energy. In September, the Governor named a seven-member task force to determine how much fuel would be available and, if a shortage was indicated, to propose an allocation program for domestic and industrial consumers. The Governor's special representative on coal problems held a meeting in Pottsville December 17 as a direct result of the energy crisis. Representatives of the Department of Environmental Resources (DER) and the Bureau of Mines were concerned with expanding anthracite production, finding new markets, and assuring potential customers that their needs for anthracite could be satisfied.

Environment.—*Air Pollution.*—In March, DER held hearings on plans for reducing the levels of carbon monoxide in Allegheny and Philadelphia Counties before submitting the plans to EPA. DER resolved to meet EPA's primary air pollution standards by the 1975 deadline, although more time was requested to develop plans to meet EPA's secondary clean air standards.

Expenditures for existing or planned air quality control measures in Philadelphia County during 1973–74 included $150,000 for a baghouse system to collect 0.05 ton per day (17 tons per year) of particulates from one red lead furnace; $100,000 for a baghouse installation to recover 0.15 ton per day (37.5 tons per year) of particulates at an aluminum dross plant; $300,000 for baghouse systems at two asphalt batching plants to collect 1.2 tons per day (240 tons per year) of particulates; $400,000 for coke oven modifications and a baghouse system at a coke manufacturing plant to collect 1.0 ton per day (365 tons per year) of particulates; and two projects costing $6 million total in the fourth year of a 5-year program at a petroleum refinery to reduce total hydrocarbon emissions by 3 tons per day (1,095 tons per year).

Air pollution control in Allegheny County was the objective of many activities and actions. The Allegheny County Air Pollution Control Board granted a variance to the Pittsburgh Coal Co. to either April 30 or September 1974, depending on the performance of pollution controls installed to eliminate particulates emitted from a thermal coal dryer at the company's McDonald plant. In April the Board granted an 18-month variance to the Mesta Machine Co. relating to sulfur dioxide and particulate emissions from a coal-fired boiler at its Homestead plant. Also in April a variance until December 1974 was granted to Atlantic Richfield Co. (ARCO) to install a gasoline-vapor collection and disposal system at its Lawrenceville terminal. The Board also granted a variance until September 1973 on particulate emissions from crushing-and-pressing equipment at the McKees Rock plant of the Metallurgical Exoproducts Corp.

The Allegheny County Bureau of Air Pollution Control Annual Report for 1973 indicated that 60 monitoring stations showed a 13% decrease in sulfur dioxide levels compared with those of 1972. The decrease was attributed mostly to conversion from coal to natural gas or oil as fuels, the shutdown of obsolete coal-fired boilers, and the use of lower sulfur coal. The sulfur dioxide emissions from specific sources decreased from 220,000 tons in 1972 to 190,500 tons in 1973. In high-pollution areas, sulfur dioxide concentrations were down 7% to 20% from 1972 levels. However, the 1973 concentration still exceeded the EPA standard of 0.03 part per million (ppm) slated to become effective in 1975.

Duquesne Light Co. shut down six coal-fired boilers at its Reed Station on Brunot Island, thereby ending the use of coal for electricity generation in Pittsburgh and the emission of more than 12,000 tons of sulfur dioxide per year. The company also completed the conversion from coal to oil at its Allegheny steam heating plant, ending the use of coal as a source of heat for many downtown Pittsburgh buildings.

West Penn Power Co. shut down three obsolete boilers that had emitted nearly 19,000 tons of sulfur dioxide per year from its Springdale station. The Jones and Laughlin Steel Corp. (J & L) reduced sulfur dioxide emissions from its Pittsburgh Works nearly 5% by using coal having a lower sulfur content. United States Steel Corp. (U.S. Steel) plants throughout Allegheny County reduced sulfur emissions overall from 43,645 tons in 1972 to 40,780 tons in 1973. The 7% reduction resulted mainly by using low-sulfur coal. By terminating the use of coal at its East Pittsburgh boiler plant, Westinghouse Electric Corp. cut sulfur emissions nearly 100%, from 3,340 tons in 1972 to 190 tons in 1973.

Concentrations of particles of dust and soot, too fine to settle, increased about 10% over 1972 levels, based on data from 19 high-volume sampling stations, despite substantial reductions in emissions from several individual plants. The increase was attributed mostly to near-capacity iron and steel production during the year. Notable reductions were achieved by the cement industry, where installation of cyclone collectors reduced stack emissions 89% from 2,700 tons in 1972 to 300 tons in 1973. Conversion from coal to oil at downtown Pittsburgh steam-heating plants cut particulate emissions by more than a third, from 2,300 tons in 1972 to 1,500 tons in 1973. The downtown Oakland and Braddock areas of Pittsburgh showed the highest concentrations of suspended particulates, while the Springdale, North Fayette, South Fayette, and Greater Pittsburgh Airport sites, far from the Monongahela Valley with its stepped-up steel production, showed no increase over levels a year earlier. Dustfall also was a problem in Clairton and Braddock.

Allegheny County Commissioners approved a schedule of tougher penalties for criminal violations of air pollution standards. Fines were raised from $30 to $300 per day to $100 to $1,000 per day for a first violation. Violations repeated within 2 years of the first conviction were subject to a misdemeanor fine ranging from $500 to $5,000.

Legal action against U.S. Steel was appealed to higher courts. The Allegheny County Health Department and the DER filed an appeal in Commonwealth Court seeking to reverse the decision of Common Pleas Judge Silvestri Silvestri, who refused to impose a $300,000 fine on the corporation or hold it in contempt for noncompliance with an agreement to reduce emissions at the Clairton coke works. The case began in January 1972 when the county and Commonwealth filed a joint equity suit to force the steelmaker to install the best available equipment to eliminate air pollution at the coke works. Nine months later, a consent decree calling for specific control measures estimated to cost $4.5 million was signed by government and company officials. In a separate action the Health Department appealed to Commonwealth Court to uphold its denial of permits for construction of two boilers at the Clairton coke works, because the stacks proposed would not be tall enough to disperse pollutants.

During 1973 the Air Pollution Control Bureau issued more that 75 compliance orders calling on polluting firms to submit timetables for abatement. Among them were plans of action requested from J & L to install facilities to desulfurize coke oven gas at its Pittsburgh works by July 1977 with interim standards to be met in 1974; Shenango Inc. to desulfurize coke oven gas by June 1975, and cleaned up coke oven emissions by December 1975; and U.S. Steel to control fugitive emissions from basic oxygen furnaces at both its Edgar Thomson works and Duquesne works within 3 years.

Allegheny County Commissioners, responding to recommendations from the Air Pollution Advisory Committee and the Board of Health, empowered the Variance Board to hear Health Department complaints against polluters, set compliance schedules, and impose fines ranging up to $10,000 per day for each violation and $2,500 for every day the violation continued. The Commissioners also amended the air pollution code to provide special short-term variances, effective only during the winter of 1973–74, for firms that could not obtain low-sulfur fuels. Two types of variances were available: An emergency 30-day variance, nonrenewable, for firms faced with sudden and unavoidable fuel cutbacks, and a 120-day fuel-usage variance for firms and institutions that had advance notice of a loss of their supply of low-sulfur fuel. By the end of 1973 only one firm, the Duquesne Light Co., had asked for such a variance to burn

high-sulfur oil temporarily in its Allegheny steam heating plant, which was converted earlier from coal to comply with county regulations.

The U.S. Geological Survey and the Susquehanna River Basin Commission (SRBC) began, in January, an 18-month study, jointly funded by Federal and State governments, of the acid mine drainage (AMD) problem in Kingston Borough. Monitoring devices were installed at seven locations.

The status of DER's AMD studies and projects is shown in table 8.

Table 8.—Pennsylvania: Status of AMD studies and projects, 1973

	Bituminous coal		Anthracite	
	Number of studies or projects	Cost [1] (thousands)	Number of studies or projects	Cost [1] (thousands)
New studies initiated in 1973	16	$1,092	4	$398
Studies funded prior to 1973	15	947	4	486
Studies completed in 1973	5	427	8	889
Design projects initiated in 1973	26	9,640	4	1,310
Design projects in progress, contracted for prior to 1973	39	13,321	5	2,180
Design projects completed in 1973	28	4,643	5	3,137
Construction projects started in 1973	22	3,401	4	3,115
Construction projects in progress in 1973, (started prior to 1973)	30	2,938	2	659
Construction projects completed in 1973	22	8,493	6	4,869

[1] Based on contracts or estimated construction costs.

In early 1973, the U.S. Supreme Court, in a split decision involving a suit against Pennsylvania Industrial Chemical Corp., Clairton, (a producer of coal-tar and petroleum products, reclaimed oils, and synthetic resins), over turned an Appeals Court ruling that an 1899 law did not apply to the corporation's discharge of waste products into a navigable waterway. The 1899 law was not expected to be used in future actions because EPA's enforcement actions were taken under a 1972 law.

DER planned to build two settling ponds to collect iron precipitates from AMD discharged from the abandoned Wildwood mine near North Allegheny County. Portals and air shafts were sealed in 1972, but the seals failed to stop the discharge into Pine Creek of an estimated 1.5 million gallons per day of AMD containing up to 800 ppm of iron.

The Pennsylvania Supreme Court, in a 6 to 0 decision handed down March 16, upheld the right of DER to order coal mining companies to treat AMD even though it did not originate in their mines but had to be pumped out to enable mining to continue. The decision affected the Indianola mine of the Harmer Coal Co. and the Hutchinson mine of the Pittsburgh Coal Co. The court held that the only solution to the problem was to treat the AMD and that no hardship would result on the companies by increasing the cost of such treatment.

Despite a massive campaign by coal industry lobbyists, the Pennsylvania Environmental Quality Board reversing an earlier action voted 16 to 0 on May 18 to permit no more than 1.5 ppm iron in all intrastate streams. As a result of the reversal, DER for the first time could regulate AMD and other potential water pollutants.

In January, EPA made a $476,000 demonstration grant to the Allegheny County Sanitary Authority (Alcosan) to develop a program to identify, monitor, and control toxic or hazardous materials from the industrialized Greater Pittsburgh area. Alcosan sent questionnaires to all industries discharging wastes into the Alcosan system so that the type, amount, and location of waste water sources could be identified.

In December, a check of Little Dear Creek by the Allegheny County Bureau of Tests indicated that AMD and coal washery wastes had essentially been eliminated by cleanup operations at the Russelton mine of Republic Steel Corp. Some of the improvement was attributed to the contouring and seeding of coal-refuse dumps.

DER received bids on March 8 for the installation of six gas and temperature monitoring stations at three sites each in Plymouth Township and Swoyerville Borough where flood debris had been dumped into abandoned anthracite strip pits in mid-1972. The debris-filled abandoned Pagnotti pit in Plymouth Township was the site of several fires in February that threatened Swoyerville as well as Plymouth Borough. The situation was serious because the fires were above the Ross vein, which overlies the Red Ash vein. The site was approximately 175 feet deep, 200 feet wide, and 2,000 feet long. The DER awarded a contract to extinguish the fires and spread a 5-foot-thick earth cover on the extinguished debris.

The Third International Ash Utilization Symposium held in Pittsburgh March 13 and 14 highlighted developments in large-scale tonnage uses of fly ash and bottom ash. The meeting was sponsored by the Bureau of Mines, National Ash Association, National Coal Association, Edison Electric Institute, and the American Public Power Association.

Industry engineers at the American Mining Congress meeting in Pittsburgh in May called for more flexible regulations on coal-refuse disposal. The former State Secretary of Mines suggested research programs on the use of coal-refuse for highway construction and as an aggregate in concrete.

White, Chubb, and Charmbury described the use of anthracite refuse in horticulture.[5]

Mined Land Reclamation.—Thirty papers were presented at the Research and Applied Technology Symposium on Mined Land Reclamation held in Pittsburgh March 7 and 8. The National Coal Association sponsored the meeting to exchange information on the expansion of technology and research to convert reclamation from an art to a scientific discipline.

Members of the Congressional Environment Committee and the Congressional Committee on Mines and Mining in April toured five strip-mined sites in Butler, Jefferson and Venango Counties to observe examples of total restoration. Pennsylvania law requires that restoration work must begin as soon as coal is removed and that the mine operators must post a minimum bond of $500 per acre, which is not refunded until restoration is approved by DER.

Consolidation Coal Co. sold 4,000 acres overlying its worked out Solar deep mine in western Allegheny County to Alcoa Brothers for $753,000. Coal remaining in stumps and pillars will be strip-mined and sold to Duquesne Light Co. for use at its Phillips Station. During this stripping project, estimated to require 3 to 5 years, limestone underlying the coal will be blasted to permit percolation of AMD from the mine workings; some of the limestone will be used in road construction. In some areas the strip pits will be used as sanitary landfill sites until final grading operations are started. The acreage will eventually be restored to prime land in the area between the Greater Pittsburgh Airport and U.S. Route 22.

Table 9, from the annual report of the DER's Bureau of Surface Mine Reclamation, shows information on bank reclamation in bituminous coal producing counties of the State.

[5] White, J. W., W. R. Chubb, and H. B. Charmbury. Anthracite Refuse as a Soilless Medium. Min Eng., v. 25, No. 3, March 1973, pp. 48–49.

Table 9.—Pennsylvania: Spoil bank reclamation at bituminous coal mines

County	Trees planted in 1973		Grasses planted in 1973	
	Number of sites	Acres	Number of sites	Acres
Allegheny	1	6.00	5	82.16
Armstrong	12	152.60	18	430.90
Beaver	8	211.70	--	--
Butler	1	28.00	16	369.72
Cambria	6	67.72	8	196.80
Centre	24	412.64	1	49.30
Clarion	36	701.30	21	523.00
Clearfield	73	1,456.55	4	119.20
Elk	7	99.60	1	45.30
Fayette	--	--	24	199.32
Fulton	1	25.00	--	--
Greene	--	--	4	44.40
Indiana	8	90.06	11	225.09
Jefferson	22	383.89	13	186.77
Lawrence	4	48.40	8	207.60
Somerset	3	46.20	15	306.20
Tioga	4	138.67	5	176.98
Venango	1	2.70	2	41.00
Washington	--	--	13	399.48
Westmoreland	1	10.00	16	191.39
Total	212	3,881.03	185	3,794.61

Table 10 shows information on bituminous coal surface-mining operations that appear in the 1972 Annual Report of the Licensing and Bonding Division, Bureau of Surface Mine Reclamation, DER.

Table 10.—Pennsylvania: Bituminous coal surface mining operations

Mine drainage control:	
Applications:	
Received:	
New	600
Amended	145
Issued:	
New	258
Amended	94
Enforcement action:	
Permits revoked	0
Permits suspended	7
Reinspections reports	4,946
Violations—mine drainage control	325
Strip mines:	
Total surface mine operators, 1972	740
Mining permits:	
Applications received for permit	900
Original (7,336.99 acres)	364
Amended (6,408.32 acres)	389
Corrected and reissued (1,718.77 acres)	52
Bond deposit:	
Surety at $1,000 per acre	$1,542,300.00
Surety at $500 per acre	4,440,784.50
Collateral at $1,000 per acre	93,400.00
Collateral at $500 per acre	1,772,026.75
Total	7,848,511.25
Collateral reapplied	$202,500.00
Bond released:	
At $1,000 per acre	$100,380.00
At $500 per acre	3,749,284.48
At $400 per acre	64,417.00
At $300 per acre	15,912.00
Total	3,929,993.48
Completion reports inspected:	
Approved partials	134
Approved acres—partial	2,771.98
Approved finals	255
Approved acres—final	4,411.43
Completion reports:	
Received	462
Number of acres	9,584.75
Suspension of mining license:	
Hearing or conferences	15
License suspended	0
Operations ceased	9
Bituminous mines working:	
Strip	568
Auger	27

In November, Federal funds were allocated to build a park on strip-mined land in Pennsylvania's 22d Congressional District to honor the late Rep. John P. Saylor, a leading conservationist during his 24 years in Congress.

A total of 369.3 acres of land reclaimed by mine operators in the anthracite region were seeded in grasses and legumes, and 25.0 acres were planted with shrub seedlings comprising Asiatic crabapple, multiflora rose, autumn olive, tartarian honeysuckle, and coralberry. The seedlings were planted on selected strip-mined sites to obtain the greatest benefit as food or cover for wildlife. In comparison with prior years, only 12,000 tree seedlings were planted on a few sites that were also seeded in grasses and legumes. This reduction in tree planting and the increase in grass seeding reflected the increased interest in obtaining a faster growing, complete vegetative cover to help control and reduce sedimentation.

In midyear, the associate deputy secretary of DER stated that a lack of manpower would probably prevent full implementation of the State's All-Surface Mining and Reclamation Act. His report to the Environmental Quality Board showed that the number of surface mine operators had increased 90% from 390 to 743, while in the same period the regulating staff had increased only 3%. To implement the Board's recommendations and guidelines, the only action possible appeared to be to give priority to the surface mining of coal since it had the greatest potential for pollution problems. Noncoal surface mining would be assigned secondary priority on the basis of urgency and need of applicants for permits. Reportedly, the lack of inspectors and personnel to process permits was attributed to eliminating part of the $2.7 million from 1973–74 budget proposals for DER.

Electricity Generation.—*Fossil Fueled.*—Construction continued on the Bruce Mansfield steam electric station, a project jointly controlled by five electric utilities and called CAPCO, to supply electricity to western Pennsylvania and northern and central Ohio. In July, CAPCO announced that a third 825–MW coal-fired generating unit would be built, with completion scheduled in 1978. DER asked on February 2 to approve installation of a sulfur dioxide removal system, developed by Chemical Construction Corp., for two 825–MW coal-fired generating units. On May 19 the Beaver County Industrial Development Authority approved a $68.5 million revenue bond issue to partially finance pollution control facilities estimated to cost $133 million at the Bruce Mansfield station.

Two oil-fired peaking units and three more under construction at Duquesne Light Co.'s Reed Station will have a 138-MW total capacity. The Allegheny County Air Pollution Appeals Board granted Duquesne a variance on the Phillips station until May 1, 1974, because of failure to meet the scheduled installation of air pollution control equipment.

Pennsylvania Power and Light Co. (PPL) started full operation of the 750-MW coal-fired No. 2 unit at its Montour station in April.

PPL continued work on two 800-MW oil-fired steam electric units at the Martins Creek site on the Delaware River where two small coal-fired units were in use. At yearend Unit No. 3 was 68% complete and Unit No. 4 was 11% complete. Unit No. 3 was expected to reach commercial operation in early 1975 following one year of test. Despite the short supply of oil in late 1973, the Martins Creek units were not to be converted to coal from oil. Such a conversion would have delayed electricity generation for 5 to 6 years. The new units will burn either crude or residual oil, and they will be used instead of combustion turbines for electricity generation because the latter can burn only No. 2 (home heating) oil and at a significantly lower efficiency. Work on the 82-mile Interstate Energy Co. pipeline between Marcus Hook and the Martins Creek station had not been started despite authorization by the PUC in February 1973. Additional approvals had to be obtained from the Delaware River Basin Commission (DRBC) and other agencies and authorities. Because the pipeline could not be completed in time for the startup of the No. 3 unit, PPL made provisions for emergency rail unloading and terminal facilities at Martins Creek and terminal facilities at Marcus Hook.

The Lehigh County Industrial Development Authority on April 11 placed on sale $28 million of tax-exempt first mortgage bonds to finance pollution-control systems at several PPL stations. On March 16 and April 6, the FPC received PPL's

requests for the renewal of 50-year licenses for one hydroelectric plant in Clarion County and one plant in Wayne and Pike Counties.

In 1973, PPL generated 26 billion kilowatt-hours of electricity, of which 96% came from coal-fired units that required about 9 million tons of solid fuels. PPL provided about 7 billion kilowatt-hours of electricity to companies more dependent on oil, mostly those in the Pennsylvania-New Jersey-Maryland (PJM) power pool. This coal-generated power was estimated to have eliminated the purchase of about 300 million gallons of oil by PJM.

PPL had coal resources totaling 120 million tons through ownership or control of five mines in west-central Pennsylvania and through long-term contracts for open-market coal. Increases in the cost of open-market coal were recovered through a fuel adjustment surcharge in PPL's rate structure that was approved by the Pennsylvania PUC and the FPC in 1970.

PPL scheduled operation of its seventh unit train in 1974. Each existing unit train hauled more than 10,000 tons of coal each trip over Penn-Central tracks. Legislation providing $560 million for the reorganization of seven bankrupt railroads including the Penn Central gave PPL some assurance of continued rail haulage service.

The United Gas Improvement Corporation (UGI), the electric utility division of which served 52,000 customers in Pennsylvania, announced that it would participate with other utilities in a nuclear or fossil-fueled generating plant, or both, to gain 200 megawatts of new capacity needed by 1980. UGI tentatively agreed to commit $75 million for the new generating capacity for which cost and engineering studies were being made.

The following data on future fuel use was reported in Keystone News Bulletin's 20th Annual Electric Utility Survey. Total figures for 1974–76 are shown in thousands tons of coal equivalent for several Pennsylvania electric utilities as follows: Duquesne Light Co., coal 13,835, and oil 499; Pennsylvania Electric Co., coal 39,167, and oil zero; Pennsylvania Power Co., coal zero; PPL, coal 26,826, and oil 3,410; Philadelphia Electric Co. including jointly owned utilities, coal 10,860, oil 16,895, and gas zero.

Table 11 indicates net generation, fuel consumption, and unit costs in Pennsylvania's 42 steam-electric plants in 1973.

Table 11.—Pennsylvania: Net generation, fuel consumption, and unit costs in 42 steam-electric plants

Installed generating capacity	thousand kilowatts	19,353.1
Net generation	million kilowatt-hours	100,447.7
Coal:		
Consumption	thousand tons	38,915
Btu per pound		11,966
Cost f.o.b. plant:		
Per ton		$10.77
Per million Btu		$0.45
Oil:		
Consumption	thousand barrels	17,453
Btu per gallon		142,684
Cost f.o.b. plant:		
Per barrel		$5.14
Per million Btu		$0.864
Gas:		
Consumption	million cubic feet	365
Btu per cubic foot		1,050
Cost per million cubic feet		NA

NA Not available.

Source: National Coal Association. Steam-Electric Plant Factors. 24th ed., December 1974, 110 pp.

Nuclear Powered.—The total capacity of nuclear-powered electric generating units[6] under construction or planned in Pennsylvania as of September 1973 follows:

[6] Keystone News Bulletin. Status of the U.S. Nuclear-Powered Generating Units as of September 30, 1973. V. 31, No. 12, December 1973, p. 6.

Scheduled date of commercial operation	Capacity, net MW
1973	1,065
1974	2,736
1976	905
1978	852
1979	2,117
1980	1,065
1981	2,192
1983	1,140
1973–83	12,072

However, according to an FPC report,[7] commercial operations of nuclear-powered plants under construction will certainly be delayed because of the rescheduling of associated facilities, equipment failures, low productivity of labor, changes in regulatory procedure under the Occupational Safety and Health Act (OSHA), and safety checks by the Atomic Energy Commission (AEC). The Chairman of the Pennsylvania PUC warned that a 2-year delay in getting these plants in operation would cause Pennsylvania's reserve electric power capacity to almost vanish.

In early October the AEC barred the construction by the New Jersey Public Service Electric and Gas Co. of a $900 nuclear-power steam-electric station on the New Jersey side of the Delaware River 11 miles northeast of Philadelphia because of the proximity of the site to Philadelphia and its satellite towns and cities. The company lost $25 million in studies for the 2,200-MW plant, and $5 million for excavations already performed.

On December 7, Duquesne Light Co. officials met with an AEC advisory committee on reactor safeguards to discuss design features of the proposed Beaver Valley No. 2 nuclear-powered steam-electric station at Shippingport. A construction permit for the plant depended on the AEC's decision. In late October, Nuclear Fuel Services Inc. signed a $4 million contract to provide transportation and nuclear fuel reprocessing services for CAPCO's 856-MW Beaver Valley No. 1 unit under construction at Shippingport.

In November, Kerr-McGee Corp., Oklahoma City, Okla., was awarded a $150 million contract from CAPCO for 12 million pounds of U_3O_8 produced from uranium hexafluoride at Sequoyah, Okla. Delivery of the U_3O_8 was to begin in 1977 and continue through 1985. The major portion of the U_3O_8 will be delivered to CAPCO's Beaver Valley electric generating complex, and the remainder will be delivered to two CAPCO electric generating units at Berlin Heights, Ohio, and Port Clinton, Ohio.

In late December, PPL awarded $155 million in contracts for nuclear fuel for its Susquehanna Station 5 miles north-east of Berwick. Anaconda Sales Co. will provide the initial fuel loadings for the station's twin boiling-water-reactor generating units scheduled for commercial operation beginning in 1979 and 1981. Both units' fuel requirements from 1981 through 1985 will be provided by Gulf Nuclear Fuels Co., a division of Gulf Oil Corp. The contract with Gulf included fabrication of eight reloads for the units. The total amount of uranium fuel to be supplied by the two companies was 3,200 tons. PPL signed an additional contract in December with the AEC for enrichment of uranium for Unit No. 1 from 1978 to 1987. An enrichment contract for Unit No. 2 fuel will be signed before June 30, 1974, as required by AEC procedures.

PPL received AEC construction permits for the generating units of the 2,200-MW Berwick plant in early November following 31 months of review of the proposed project by Federal, regional, State, and local agencies. PPL then began construction work on a $1.4 billion nuclear-powered steam electric plant on a 995-acre site in Salem Township near Berwick. Unit No. 1 was scheduled for commercial operation in 1979 and Unit No. 2 in 1981.

In late October, the Philadelphia Electric Co. received a permit from the AEC to operate the 1,065-MW Peach Bottom No. 2 nuclear-powered boiling-water reactor at 100% of capacity. The facility had been operated at 10% capacity since construction was completed in August. A spokesman said the unit should be up to 100% capacity in 1 or 2 months.

A preliminary report ordered by the AEC was released March 8 indicating that radiation levels in a 500-square-mile area surrounding the 15-year-old, 100-MW Shippingport nuclear-powered generating plant operated by Duquesne Light Co. were no higher than normal background counts. Further studies tended to confirm the AEC report. The plant's safety was originally questioned by a University of Pittsburgh professor of radiology who claimed that radiation from the plant in-

[7] FPC News. FPC Staff Reports on Delays of Scheduled Operation of Electric Generating Units. V. 6, No. 10, week ended March 9, 1973, p. 6.

creased infant mortality in the vicinity of Aliquippa and contaminated milk from nearby dairies.

A study conducted by Gilbert Associates, Inc., Reading, of the proposed operation of cooling towers at Metropolitan Edison Co.'s Three Mile Island nuclear-powered steam electric station near Harrisburg concluded that such an operation would have no ill effects on the nearby Harrisburg International Airport. The station will have four 372-foot-high natural draft cooling towers. Scheduled completion of Unit No. 1 was in mid-1974 and of Unit No. 2 in 1976.

Opposition to the licensing of the nuclear-powered steam electric station on Three Mile Island near Harrisburg was withdrawn in November when the operator agreed to install additional low-radiation filter equipment at the plant.

A Duquesne Light Co. spokesman stated in early December that in 1973 less than 2% of Pennsylvania's electricity came from nuclear-powered plants, and that in 1981 the percentage will be 35%. In the meantime, the use of coal for electrical generation will decrease from 80% to 49% in 1981. The spokesman further stated that a 2,000-MW-capacity nuclear-power steam-electric plant could eliminate the use of between 20 million and 30 million barrels of oil or 4.8 to 7.2 million tons of coal annually.

Table 12.—Pennsylvania: Fuel consumption, 1973
(10^{12} Btus)

Fuel	Electricity generation [1]	Industrial	Transportation	Residential	Commercial	Government and other
Coal	852	872	--	38	120	146
Petroleum	143	320	864	--	232	326
Petroleum & other	--	--	--	403	--	--
Natural gas	--	300	--	412	100	15
Natural gas and nuclear	15	--	--	--	--	--
Total	1,010	1,492	864	853	452	487

[1] Hydropower also equaled 42×10^{12} Btu for electricity generation.

Source: Smigel, A. E. Statistical Benchmarks for Energy in Pennsylvania. Pennsylvania Department of Commerce, Release 5-4-74, April 1974, 5 pp.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Anthracite.—Production, which totaled 6.83 million short tons, was the smallest in 11 consecutive years and was 3.9% less than in 1972. However, its $90.26 million value was 5.9% more than in 1972 because of an increase in average value of $1.21 per ton to $13.21 per ton.

Commercial exports, principally to Canada and Western Europe, totaled 716,546 tons, 26,905 tons less than in 1972. The Federal Government continued purchasing anthracite to supply most of the solid-fuel needs of the U.S. Armed Forces in West Germany. Such purchases totaled 442,499 tons, compared with 447,728 tons in 1972.

U.S. consumption (in thousand tons) was distributed as follows: Residential and commercial heating, 2,917; electric utilities, 1,442; industrial and miscellaneous uses, 603; coke plants, 467; sintering and pelletizing, 231; and colliery fuel, 11.

Production originated from 86 underground mines having 716 employees, 113 strip mines having 1,633 employees, 62 bank operations 327 employees, and 7 dredging operations having an estimated 50 employees.

Table 13.—Pennsylvania: Anthracite production and value, by county
(Thousand short tons and thousand dollars)

County	Production	Value
Berks, Lancaster, Snyder	441	3,070
Carbon	116	1,621
Columbia	12	184
Dauphin	40	510
Lackawanna	232	3,795
Luzerne	1,982	29,663
Northumberland	959	11,940
Schuylkill	3,003	39,081
Sullivan	41	381
Susquehanna	4	15
Total	[1] 6,830	[2] 90,260

[1] Includes dredged production, 441.
[2] Includes dredged production, 3,070.

Schuylkill and Luzerne Counties accounted for 73% of the total production. Schuylkill County was the leading producing county with about 77% of the total deep-mined production, about 44% of the total strip-mined production, and 68% of the production from bank operations.

Production (in thousand tons) by origin was distributed as follows: Deep mines, 726; strip mines, 3,279; bank operations, 2,384; and dredging operations, 441. All production, except that from dredging operations, came from the processing of raw coal and culm bank solids in 95 breakers and washeries having 1,357 employees.

Run-of-mine (ROM) material containing 416,000 tons of salable product, and amounting to more than 57% of the total underground production, was mechanically loaded. Underground mechanical loading on the basis of tons of contained salable product comprised 220,000 tons by 72 scraper loaders, 100,000 tons by 4 mobile loaders, and 96,000 tons by a total of 47 duckbills, pit-car loaders, and self-loading conveyors.

Strip mining and bank operations collectively used 138 diesel-powered front-end loaders, 16 electric shovels, 34 diesel shovels, 1 gasoline dragline, 34 electric draglines, and 77 diesel draglines.

Productivity data (excluding dredging) for the industry are shown in table 14. Compared with 1972 data, productivity declined.

Table 14.—Pennsylvania: Anthracite productivity data, 1972–73

Activity	Production (short tons)		Man-days [1]		Productivity (tons per man-day) [1]		Percent change
	1972	1973	1972	1973	1972	1973	
Deep mined:							
Extraction	896,991	702,843	197,242	173,141	4.55	4.06	−10.8
Preparation	896,991	702,843	41,654	35,235	21.53	19.95	−7.3
Total or average	896,991	702,843	238,890	208,376	3.75	3.37	−10.1
Strip mined:							
Extraction	3,492,444	3,284,905	393,825	381,198	8.87	8.62	−2.8
Preparation	3,492,444	3,284,905	162,205	164,660	21.53	19.95	−7.3
Total or average	3,492,444	3,284,905	556,030	545,858	6.28	6.02	−4.1
Culm bank:							
Extraction	2,072,658	2,305,265	48,656	76,333	42.60	30.20	−29.1
Preparation	2,072,658	2,305,265	96,242	115,545	21.53	19.95	−7.3
Total or average	2,072,658	2,305,265	144,898	191,878	14.30	12.01	−16.0
State total: [2]							
Extraction	6,462,903	6,293,013	639,723	630,672	10.10	9.98	−1.2
Preparation	6,462,903	6,293,013	300,101	315,440	21.53	19.95	−7.3
Total or average	6,462,903	6,293,013	939,824	946,112	6.88	6.65	−3.4

[1] Includes personnel engaged in maintenance, haulage, stripped land surface reclamation, etc.
[2] Excludes dredged coal.

NOTE.—All data in this table were derived from annual reports, published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources, that summarize mandatory monthly reports submitted by the anthracite industry.

According to DER data, one fatality occurred in Luzerne County due to a roof fall. Of the 370 non-fatal accidents in the industry, 182 occurred in Schuylkill County and 104 in Luzerne County. Active underground mines comprised 24 rated as gaseous and 62 rated as non-gaseous. The entire industry consumed 1,634,657 pounds of various dynamites and 29,880,947 pounds of other permissible explosives.

Railroad shipments totaled 2,951,000 tons valued at $39,239,000 ($13.30 per ton). Truck shipments totaled 3,868,000 tons valued at $50,489,000 ($13.14 per ton). Colliery fuel totaled 11,000 tons valued at $172,000 ($15.64 per ton). The value of 441,000 tons of dredged produc-

tion was $3,070,000 ($6.96 per ton). Total nondredging production was 6,378,000 tons and averaged $13.63 per ton.

The approximate average and range of sulfur content of Pennsylvania anthracites follows: [8]

Area	Percent Sulfur	
	Average	Range
Northern anthracite field	0.87	0.5–3.5
Middle anthracite field	.60	.3–1.7
Southern anthracite field	.68	.3–1.7
Pennsylvania anthracite seams	.76	.3–3.5
Pennsylvania anthracite culm	.80	.4–2.7

On October 25, PPL announced that it would stop dredging in the lower Susquehanna River where the company had recovered anthrafines since 1924. Reportedly, floodwaters from Hurricane Agnes in June 1972 scattered the remaining pockets, and economical recovery no longer was feasible.

In an action instituted under the Federal Coal Mine Health and Safety Act of 1969, the Bureau of Mines on February 14 filed suit against a corporation trading under the name Penn State Mining, Inc., to compel sealing of the entrance of its abandoned No. 1 Slope mine in Dickson.

The Blue Coal Corp., as a result of payments to the black lung benefit fund, on August 15 increased the price of anthracite at the breaker by about $1 per ton. The new prices were pea $21.50; buckwheat and rice $20.95; and chestnut $22.95. Customers also paid for truck haulage depending on the length of haul.

The DER's Bureau of Topographic and Geologic Survey published the following data showing the anthracite mined and remaining reserves (in short tons) as of January 1, 1970:

County	Mined out	Reserves
Carbon	320,000,000	310,000,000
Columbia	130,000,000	480,000,000
Dauphin	140,000,000	740,000,000
Lackawanna	1,600,000,000	390,000,000
Lebanon	4,000,000	1,000,000,000
Luzerne	2,800,000,000	1,700,000,000
Northumberland	680,000,000	1,900,000,000
Schuylkill	2,200,000,000	9,900,000,000
Susquehanna	1,000,000	5,000,000
Wayne	4,000,000	6,000,000
Total	7,879,000,000	16,431,000,000

According to a UGI official no construction was started in 1973 on a proposed 300-MW steam-electric plant in the Northern anthracite field. The proposed plant would be fueled with upgraded culm bank material burned in Ignifluid combustor furnaces.

Bituminous Coal.—Pennsylvania was the third largest bituminous-coal-producing State and had 4 of the 50 largest producing mines in the United States. Three underground mines and one strip mine collectively produced 9,880,240 tons or 6.8% of the total production from the countrys 50 largest producing mines.[9]

In late 1973, Pennsylvania coal operators indicated that surface-mined production could probably be increased in 3 to 6 months by approximately 6 million tons annually if sufficient supplies of diesel oil and ammonium nitrate were available for blasting use, if railroad service was adequate and if air pollution standards were relaxed for at least 5 years so that capital would become available with which to expand production. The availability and cooperation of labor would also be required.

Bethlehem Steel Corp. announced plans in December to open the new Cambria No. 78 underground mine near Johnstown. Development work estimated to cost $9 million was to start in early 1974, and some coal production was scheduled for 1975. Eventually the mine will employ 250 persons. The site had 3,422 acres of metallurgical-grade coal. Life of the mine was estimated at more than 20 years.

In April, Helvetia Coal Co., a subsidiary of the Rochester and Pittsburgh Coal Co., started development work estimated at $5.2 million for its Lucerne No. 8 mine near Clarksburg. The mine eventually will produce 300,000 tons annually and will employ about 100 men by 1975 or 1976. Coal from the mine will be delivered to the Homer City electric generating complex.

In March, National Steel Corp. announced the start of a new mine near Johnstown to produce low-volatile metallurgical coal. Consolidation Coal Co. will do the development work and operate the mine for National Steel. Starting in 1975 the mine is slated to employ 180 persons and to produce 750,000 tons annually. The site has 1,900 acres of 7-foot-thick coal, about 400 feet below

[8] Pennsylvania Geologic Survey. Pennsylvania Geology, v. 4, No. 6, December 1973, p. 3.

[9] Coal Age. The 50 Biggest Bituminous Mines in 1973. V. 79, No. 4, April 1974, p. 42.

the surface. The project will include a preparation plant and water treatment facilities to prevent contamination of Dark Shad Creek.

United States Steel Corp. scheduled limited production sometime in 1974 from its new Dilworth mine in Greene County, 65 miles south of Pittsburgh. The run-of-mine coal will be processed at the Robena preparation plant. The corporation's recently opened Mt. Braddock deep mine in Fayette County was being brought up to full capacity to yield 2,000 tons per day of cleaned coal.

The reopening of the Leechburg Coal Co.'s deep mine in Armstrong County, scheduled for late 1973, was delayed by a dispute between the company and DER over a 100-foot barrier between old workings and the new area the company planned to mine. DER contended that the barrier would prevent drainage from the new area into the old workings, thereby increasing the water pressure sufficiently to cause blowouts at the seam outcrop. The company opposed leaving the barrier because it contained coal valued at $800,000.

In early May, the Pittsburgh Coal Co. Div., Consolidation Coal Co., closed its Hutchinson mine in Westmoreland County and idled 170 miners. Coal reserves in the mine, which once produced 525,000 tons annually, were exhausted. At about the same time, Pittsburgh Coal Co. laid off 80 men of its 250-man force at its Westland mine in Washington County because of large financial losses.

In early April, the Commonwealth Court ordered two new coal mining developments in Greene County to suspend operations until drainage permits were obtained from DER. The suspensions affected four or five mine shafts at U.S. Steel's Dilworth mine and an air shaft at the Blacksville mine of Consolidated Coal Co.

On July 18 fire destroyed a coal tipple at Bethlehem Steel Corp.'s Ehrenfeld Mine No. 38 and damaged several loaded railroad cars and a conveyor belt outside the mine.

As a result of a labor dispute between the UMWA and Union Carbide Co., the company's Fawn mine was struck January 3. Pickets prevented 500 miners from working at Consolidated Coal Co.'s Renton mine and Harmar Coal Co.'s Harmar mine and Oakmont mine, even though these three mines were not involved in the dispute.

On April 30 about 500 miners and other employees left work at Florence Mining Co.'s Robinson and No. 2 portals and at the preparation plant that supplied coal to the Conemaugh steam-electric station. On May 1, the walkout spread to the Blacklick portals of the Florence Mining Co. and Helen Mining Co.'s "A" portal, idling 500 workers.

On March 6, pickets from a UMWA local shut down six mines and idled about 1,600 workers because of an intra-union pension dispute. Mines shut down in Armstrong County were the Cadogan mine of the Allegheny River Mining Co. and the Carpentertown mine of the Carpentertown Coal and Coke Co., owned by Sharon Steel Corp. Mines shut down in Indiana County were the Jane, Emily, and Margaret mines of Rochester and Pittsburgh Coal Co., employing a total of 800 workers, and the Helen mine employing 325 workers and owned by North American Coal Co. The mines resumed partial production March 8 after a court-ordered termination of the picketing.

A walkout strike at J&L's Vesta No. 4 mine and Vesta No. 5 mine near California ended March 14. The week-old strike followed a pay dispute with employees who left the mine during investigation of a bomb threat.

A 2-day walkout strike at U.S. Steel's Robena complex started November 18 and idled 1,200 workers because of a seniority dispute in September 1973.

U.S. Steel's Robena No. 1 mine employees won the Sentinel of Safety, the highest mine safety award, by accumulating 740,496 man-hours without a disabling injury in 1972. Employees at U.S. Steel's Maple Creek No. 2 mine and the Robena No. 2 mine also worked throughout 1972 without a disabling injury, but these mines accumulated less hours worked.

Republic Steel's Clyde mine at Fredericktown and the Russelton mine at Russelton operated during 1973 without a lost-time accident. The Clyde mine won the Republic Coal Mine President's Award because it worked more man-hours than Russelton.

Bethlehem Steel Corp. received U.S. patent 3,696,923 for the separation and recovery of fine coal particles from water discharged from coal preparation plants. The system will be installed at the corporation's Ellsworth preparation plant Washington County. The invention per-

mits the recycle or discharge of water without causing pollution. The process can treat a water-coal slurry containing 15 to 35 weight-percent fine coal by froth flotation to produce water containing less than 0.1 weight-percent fine coal particles. The method was available for licensing.

Transco Energy, Marcus Hook, planned a 250-million-cubic-foot-per-day (MMcfd) SNG plant based on the BASF-Lurgi process. The plant was scheduled for completion by Fluor Corporation in early 1974.[10]

Bench-scale tests at Gulf Oil Co.'s research laboratory, Harmarville, developed a catalytic coal liquefaction process that produced a form of crude oil with very encouraging results. An expanded and integrated pilot plant was being designed to permit use of the process on coals having varied sulfur and ash contents.

On January 24 the General State Authority (GSA) directed all architects to specify coal-burning equipment in new public buildings. The GSA decision followed a request to use electricity for heating a correctional institute in Mercer County.

On January 15, the Governor ordered cutbacks in the use of energy in all State offices and urged homeowners and other users to conserve oil or face a serious energy crisis. The Governor presented recommendations to reduce by 10% to 20% the consumption of heating oil in about 1.3 million oil-heated homes in Pennsylvania.

Delta Mining, Inc., near Jennerstown, using a shortwall mining system in the 6.5-foot Lower Kittanning seam, averaged 550 tons per shift and achieved a production of 900 tons per shift for a single day. The floor of the drift mine was dark shale, and the immediate roof was heavily laminated shale having excellent caving characteristics. The shortwall mining began July 11 under 75 to 130 feet of cover. Face lengths ranged from 130 to 170 feet, and the depth of panel averaged 650 feet.

Dravo Corp. was awarded a $4.6 million contract to design and construct a coal preparation plant in Duquesne Light Co.'s Warwick mine near Greensboro. The new facility, scheduled for completion in January 1974, will produce 1,000 tons per hour of cleaned coal, all from the Warwick mine. The preparation plant will have a Dorr-Oliver Cabletorq thickener capable of recovering 1,600 tons per day of minus 28-mesh coal, two-stage water-only cyclones, and also heavy-media cyclones. About half of Duquesne's coal requirement were produced by the Warwick mine.

Barnes & Tucker Co.'s new coal preparation plant, engineered and constructed by Heyl & Patterson, Inc., attained promised tonnage and product quality October 1.

Shipments of new equipment to the State's deep mines in 1973 included 1 mobile loader, 33 continuous miners, 2 cutting machines, 4 longwall units, 31 shuttle cars, 37 rubber-tired tractors, 54 battery-powered front-end loaders, 51 rubber-tired mine cars, and 53 gathering and haulage conveyors.

Washington, Greene, Indiana, Cambria, and Armstrong Counties produced 37.80 million tons, or 81.8% of the total deep-mined coal. Clearfield, Clarion, Somerset, Armstrong, and Indiana Counties produced 17.83 million tons, or 59.8% of the total strip-mined coal. Butler, Armstrong, Indiana, Elk, and Jefferson Counties produced 71.6% of the total auger-mined coal. Cambria County produced 70.2% of the coal reclaimed from refuse piles. Collectively, Washington, Indiana, Greene, Cambria, and Armstrong Counties produced 45.61 million tons, or 59.7% of the State's total bituminous coal production, and had 18,147 employees or 67.9% of the total employees of the State's bituminous coal industry.

Active mines producing more than 1,000 tons per year totaled 964; 134 were deep mines, 25 less than in 1972; 775 were strip mines, 153 more than in 1972; and 55 were auger mines, the same number as in 1972.

The 76.40-million-ton production in 1973 was valued at $786.8 million, compared with the 75.94 million tons produced and valued at $694.3 million in 1972.

The average f.o.b. mine value increased to $10.30 per ton from $9.14 per ton in 1972. Open market sales totaled 52.93 million tons and averaged $8.71 per ton at the mine; 23.47 million tons of captive coal averaged $13.88 per ton at the mine.

[10] Oil and Gas Journal. Gas Processing-Worldwide Construction. V. 71, No. 13, Mar. 25, 1973, pp. 122–123.

Table 15.—Pennsylvania: Bituminous coal production in Pennsylvania, by type of mine and county, 1973

(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total [1]	
Allegheny	7	13	1	21	3,631	618	11	4,260	$51,037
Armstrong	14	71	14	99	4,138	2,586	77	6,801	53,427
Beaver	1	2	--	3	128	12	--	140	1,331
Blair	--	1	--	1	--	57	--	57	430
Butler	3	35	10	48	52	986	99	1,137	8,128
Cambria	18	31	1	50	6,054	1,650	14	7,717	108,334
Centre	1	15	--	16	469	499	--	968	9,751
Clarion	--	90	--	90	--	4,595	--	4,595	36,357
Clearfield	5	141	4	150	713	5,703	20	6,436	48,860
Clinton	--	7	--	7	--	453	--	453	3,305
Elk	--	17	3	20	--	650	23	673	4,686
Fayette	3	58	2	63	771	1,408	4	2,183	18,918
Greene	16	18	--	34	8,232	464	--	8,696	112,263
Indiana	24	54	4	82	7,328	1,745	44	9,117	88,032
Jefferson	4	47	4	55	71	1,454	19	1,544	12,380
Lawrence	--	16	5	21	--	507	24	531	3,459
Lycoming	--	3	--	3	--	132	--	132	576
Mercer	--	5	--	5	--	239	--	239	1,989
Somerset	17	73	5	95	1,329	3,203	24	4,556	39,441
Tioga	--	2	--	2	--	555	--	555	2,966
Venango	--	12	--	12	--	441	--	441	2,406
Washington	14	33	1	48	12,044	1,233	5	13,282	159,175
Westmoreland	7	31	1	39	1,248	638	3	1,889	19,541
Total [1]	134	775	55	964	46,207	29,829	366	76,403	786,792

[1] Data may not add to totals shown because of independent rounding.

Approximately 51.2 million tons were transported by rail and water, 22.2 million tons by unit train, 7.2 million tons by conveyor belt, and 17.7 million tons by truck. Approximately 300,000 tons was used for local domestic heating, for heat and power at mines, and for coke manufacture.

Sixty-eight mechanical cleaning plants, three less than in 1972, produced 45.7 million tons of salable coal. The percentages of cleaned coal by origin were 84.0 deep mines and strip mines 16.0. Wet washing equipment by types and the approximate production of cleaned coal in million tons were tables 3.7, launders 0.3, from flotation 2.0, dense medium 18.7, classifiers 1.8, and jigs 12.3. Pneumatic-type equipment produced 6.9 million tons of cleaned coal. Cleaning plant refuse totaled 17.3 million tons.

The percentage of bituminous coal cleaned by various types of equipment follow:

Type of equipment	Underground		Strip mines, noncaptive
	Captive	Noncaptive	
Classifiers	0.77	1.01	--
Flotation	7.58	2.29	--
Jigs	19.16	22.08	56.97
Launders	8.59	--	--
Dense medium:			
Sand	13.34	4.98	--
Magnetite	42.29	28.97	28.14
Tables	8.27	9.80	3.87
Pneumatic	--	30.87	11.02
Total	100.00	100.00	100.00

Six companies operated 13 thermal drying units to produce 5.39 million tons of coal. Of the 59.6 million tons of coal crushed in 18 plants, 45.7 million tons were cleaned at 68 plants performing crushing.

According to the 1973 DER Annual Report of the Anthracite and Bituminous Coal Divisions, 22 deep mine operators, whose production exceeded 500,000 tons per year, collectively produced 40,860,105 tons of salable product. Six strip mine operators, whose production exceeded 500,000 tons per year, collectively produced 6,001,371 tons of salable product. Underground mines consumed 73,194 pounds of dynamites and other permissible explosives. Strip and auger mines consumed 6,387,138 pounds of dynamites, 146,492,553 pounds of AN–FO, and 145,065 pounds of other permissibles.

The DER report distributed the total production of 76,796,661 tons as underground mines 46,327,179 tons, strip mines 29,326,629 tons, auger mines 311,419 tons, and reclaimed from refuse piles 831,434 tons. The report listed 620 operators, some of whom operated in more than one of the State's 47 bituminous districts. The total production came from 455 deep mine operators, 343 companies that operated strip and auger mines, and 8 companies that operated refuse piles for coal recovery.

Continuous-mining machines totaled 466, 32 fewer than in 1972, and produced 41.6 million tons of coal, 1.4 million tons less

than in 1972. Because 41 machines were not designed to perform loading, mobile loaders were teamed with them to load 2.3 million tons from the mine floor; these 41 machines mined and loaded 2.3 million tons onto feeder conveyors. The other 425 machines mined and loaded 39.3 million tons into shuttle cars and rubber-tired trailers.

Fourteen longwall systems produced 2,749,018 tons of coal, 395,000 tons more than the 2,354,000 tons produced by 12 longwall systems in 1972. In 1973, 1 planer-type installation produced 197,500 tons, and 13 shearer-type installations produced 2,551,518 tons.

Two mobile loaders discharged 13,427 tons into mine cars or onto conveyors, and 1,729,289 tons were loaded into shuttle cars and rubber-tired mine cars by 45 mobile loaders. Coal loaded by hand totaled 103,834 tons.

A total of 56 cutting machines, 14 fewer than in 1972, were used to cut 1,842,767 tons. Coal shot from the solid totaled 3,783 tons.

Coal drilling by 34 handheld or post-mounted drills, 20 less than in 1972, was used to produce 415,002 tons of coal, and 21 mobile drills, the same number as in 1972, were used to produce 1,421,670 tons of coal.

Roof bolting employed 239 rotary drills, 79 fewer than in 1972, and 169 percussion drills, 62 fewer than in 1972. Roof or rock drills used for other purposes included 12 percussion drills, 8 fewer than in 1972, and 2 rotary-percussion drills.

Equipment used for haulage of run-of-mine coal, operating supplies, and personnel in deep mines included 1,015 trolley locomotives, 87 fewer than in 1972; 29 battery-powered locomotives, 9 fewer than in 1972; 11, 876 rail mine cars, 500 fewer than in 1972; 507 miles of mainline track and 250 miles of other track; and 717 gathering and haulage conveyor belts, 83 more than in 1972, that averaged 2,059 feet in length and totaled 279.6 miles compared with 241.1 miles in 1972. Considerable intermediate haulage was done by 1,103 cable reel shuttle cars and 23 battery-powered shuttle cars, 6 shuttle buggies, 346 rubber-tired tractors, and 693 rubber-tired trailers.

The 46.20 million-ton deep-mined production averaged $12.02 per ton f.o.b. mine, compared with $10.39 per ton for the 49.13-million-ton production in 1972.

Strip mining equipment included 470 power shovels, 34 more than in 1972, and 315 draglines, 14 more than in 1972. Approximately 95.1% of the shovels and draglines were diesel powered, and 80.4% were rated at less than 5-cubic-yard capacity. Ninety carryall scrapers were in operation, 44 more than in 1972. Other strip-mining equipment included 1,009 bulldozers, 29 horizontal drills, 150 vertical drills, 668 front-end loaders, 6 wheel excavators, 1 power broom, 62 motor graders, and 11 coal drills. No data on truck haulage of run-of-mine coal were available. The 29.83-million-ton strip-mined production averaged $7.68 per ton f.o.b. mine, compared with $6.86 per ton for the 26.26-million-ton production in 1972. C & K Coal Co. was the largest producer of strip-mined coal with 2,373,171 tons from 23 operations, all in Clarion County.

Active equipment for auger mining included 47 augers, 16 bulldozers, and 6 front-end loaders. The 366,410-ton auger-mined production averaged $6.91 per ton at the mine, compared with $6.37 per ton for the 542,000-ton production in 1972.

According to DER data, the bituminous coal industry had 26,722 employees who accrued a total of 6,279,670 man-days. The 16 fatalities in the industry comprised 5 by roof falls, 6 by inside transportation, 1 by outside transportation, 2 by outside machinery, and 2 in strip mines. Nonfatal accidents totaled 1,349. The DER report summarized bituminous coal employees in 1973 as 16,346 inside employees comprising 13 shot firers, 14 pick miners, 65 cutting-machine operators, 59 machine hand loading miners, 11,149 mechanical loading employees, and 5,046 all others; and 10,376 outside employees comprising 2,124 superintendents, foremen, and clerks, 48 employees at beehive coke plants, and 8,204 all others. The DER report further distributed the 26,722 total employees as 19,084 related to 150 underground mines, 5,192 to 903 strip mines, 103 to 49 auger mines, 2,267 to 160 tipples and preparation plants, and 76 to the recovery of salable product from 12 refuse pile operations.

Bituminous coal productivity for 1972 and 1973 is compared in table 16.

Table 17 summarizes data for deep mines, and table 18 summarizes data for strip and auger mines.

Table 19 summarizes data on methane emission in 9 counties, from 39 mines each emitting at least 100,000 cubic feet per day from each bed.

Table 16.—Pennsylvania: Bituminous coal productivity data, 1972–73

Activity	Production (thousand short tons)		Man-days (thousands) [1]		Productivity: Tons per man-day		Productivity: Percent change
	1972 [2]	1973 [3]	1972	1973	1972	1973	
Underground:							
Captive, cleaned:							
Mining	20,943	20,411	2,179.0	2,323.0	9.61	8.79	−8.5
Cleaning and preparation	20,943	20,411	179.2	197.9	116.89	103.14	−11.8
Total or average	20,943	20,411	2,358.2	2,520.9	8.88	8.10	−8.8
Noncaptive, cleaned:							
Mining	23,349	17,997	1,852.7	1,379.3	12.60	13.05	+3.6
Cleaning and preparation	23,349	17,997	143.7	135.7	162.50	130.48	−19.3
Total or average	23,349	17,997	1,996.4	1,515.0	11.70	11.88	+1.5
Noncaptive, crushed:							
Mining	4,792	7,799	441.7	821.4	10.85	9.49	−12.5
Crushing [4]	4,792	7,799	10.0	40.9	479.20	190.68	−60.2
Total or average	4,792	7,799	451.7	862.3	10.61	9.04	−15.8
Strip:							
Noncaptive, cleaned:							
Mining	11,061	7,478	444.1	292.8	24.91	25.54	+2.5
Cleaning and preparation	11,061	7,478	81.2	92.4	136.21	80.93	−40.6
Total or average	11,061	7,478	525.3	385.2	21.06	19.41	−7.8
Noncaptive, crushed:							
Mining	14,656	21,829	586.7	854.8	24.98	25.54	+1.8
Crushing [4]	14,656	21,829	45.4	115.1	322.81	189.65	−41.3
Total or average	14,656	21,829	632.1	969.9	23.19	22.51	−2.9
Auger:							
Noncaptive, cleaned:							
Mining	20	4	.5	([5])	40.00	55.56	+38.9
Cleaning and preparation	20	4	.2	([6])	100.00	181.82	+81.8
Total or average	20	4	.7	--	28.57	42.55	+48.9
Noncaptive, crushed:							
Mining	519	362	12.6	6.6	41.19	54.84	+33.1
Crushing [4]	519	362	1.2	1.9	432.50	190.52	−55.9
Total or average	519	362	13.8	8.5	37.61	42.59	+13.2
Recovery from refuse, noncaptive:							
Mining	523	523	2.7	14.0	193.70	37.36	−80.7
Cleaning and preparation	523	523	3.7	2.1	141.35	249.04	+76.2
Total or average	523	523	6.4	16.1	81.45	32.48	−60.1
Total, captive and noncaptive:							
Mining	75,863	76,403	5,520.0	5,691.9	13.74	13.42	−2.3
Cleaning and preparation	55,896	46,449	408.0	428.1	137.00	108.50	−20.8
Crushing	19,967	29,954	56.6	157.9	352.75	189.70	−46.2
Total or average	75,863	76,403	5,984.6	6,277.9	12.68	12.17	−4.0

[1] Source: Pennsylvania Department of Environmental Resources. Includes personnel engaged in maintenance, haulage, land surface reclamation, etc.
[2] Source: Pennsylvania Department of Environmental Resources.
[3] Source: Bureau of Mines.
[4] Includes crushing, sizing, and loading as normally performed at tipples.
[5] 72 man-days.
[6] 22 man-days.

Table 17.—Pennsylvania: Underground bituminous coal mine data

Coalbed (Geological name)	Type of mine					Coalbed thickness (inches)		Production by mine type (thousand tons)			Acres mined [1]
	Shaft	Slope	Drift	Gaseous	Non-gaseous	Range	Weighted average	Shaft	Slope	Drift	
Brookville	--	2	--	--	2	60–72	64	--	474	--	123.4
Double Freeport	1	2	--	3	--	--	84	922	730	--	327.8
Lower Freeport	--	3	18	6	15	30–60	46	--	2,119	2,653	1,729.0
Thick Freeport	--	1	1	2	--	96–108	104	--	544	617	186.1
Upper Freeport	--	5	14	8	11	36–66	49	--	3,269	1,914	1,763.0
Upper and Lower Freeport	--	1	--	1	--	--	78	--	919	--	196.4
Lower Kittanning	4	6	19	12	17	28–72	46	1,706	2,546	2,716	2,524.6
Middle Kittanning	--	--	3	--	3	32–42	32	--	--	286	148.9
Upper Kittanning	--	--	19	2	17	32–72	54	--	--	1,411	435.5
Upper and Lower Kittanning	1	--	--	1	--	--	42	1,044	--	--	414.3
Mahoning	--	1	--	--	1	--	54	--	4	--	1.2
Miller "B"	--	--	2	--	2	34–42	34	--	--	43	21.1
Pittsburgh	11	12	11	24	10	60–108	77	8,625	8,609	3,938	4,582.6
Redstone	--	--	1	--	1	--	50	--	--	1	.3
Sewickley	--	--	6	2	4	48–84	71	--	--	1,237	290.4
Total	17	33	94	61	83	--	60	12,297	19,214	14,816	12,690.6

[1] At 1,000 tons run-of-mine production and 720 tons salable production per acre-foot.

NOTE.—All data in this table were derived from annual reports, published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources, that summarize mandatory monthly reports submitted by the bituminous coal industry.

Table 18.—Pennsylvania: Bituminous coal strip and auger mine data

Coalbed (Geological Name)	Strip				Auger			
	Production (thousand tons)	Thickness (inches) Range	Weighted average	Acres disturbed [1]	Production (thousand tons)	Thickness (inches) Range	Weighted average	Acres disturbed [2]
"A" Rider	19	--	22.0	7.4	--	--	--	--
Bakerstown	71	28–36	30.1	20.6	--	--	--	--
Bloss	39	--	43.0	7.8	--	--	--	--
Brookville	1,632	13–60	32.1	435.8	--	--	--	--
Brush Creek	52	24–44	29.6	15.1	--	--	--	--
Cannel	1	--	20.0	0.4	--	--	--	--
Clarion	3,256	26–72	36.0	775.2	--	--	--	--
Clay Rider	17	--	18.0	8.1	--	--	--	--
Freeport:								
Lower	2,093	16–60	32.1	558.9	30	28–48	33.0	15.3
Upper	4,164	20–72	38.0	939.2	95	35–48	42.9	36.7
Upper and Lower	1,924	20–60	34.1	483.6	21	27–42	32.1	10.9
Kittanning:								
Lower	4,802	13–96	33.0	1,247.2	57	28–48	35.4	26.8
Middle	2,581	12–60	30.5	725.3	84	29–37	30.6	46.0
Upper	1,646	20–52	31.3	450.7	3	--	60.0	0.8
Lower and Upper	1,404	24–60	32.7	368.0	--	--	--	--
Lower and Middle	--	--	--	--	19	24–48	42.5	7.7
Mahoning	41	--	42.0	8.1	2	--	40.0	0.8
Mercer	139	18–48	21.3	55.9	--	--	--	--
Miller "B"	107	--	38.0	24.1	--	--	--	--
Morgan	407	--	48.0	72.7	--	--	--	--
Moshannon	10	31–48	31.4	2.7	--	--	--	--
Pittsburgh	2,369	32–144	70.9	286.4	--	--	--	--
Redstone	597	24–60	40.7	125.7	--	--	--	--
Rider	9	--	24.0	3.2	--	--	--	--
Sewickley	210	16–60	46.3	38.9	--	--	--	--
Seymour	133	--	33.0	34.5	--	--	--	--
Waynesburg	1,604	38–80	51.2	268.5	--	--	--	--
Total	29,327	18–96	36.1	6,964.0	311	24–60	35.8	145.0

[1] Based on 1,400-short-ton recovery per acre-foot.
[2] Based on 720-short-ton recovery per acre-foot.

NOTE.—This table was derived from information published in the Annual Report of the Anthracite and Bituminous Division of Pennsylvania Department of Environmental Resources.

Table 19.—Pennsylvania: Methane emission from mines emitting at least 100,000 cubic feet per day from each bed

County	Number of mines	Total average methane emission (thousand cubic feet per day)
Allegheny	4	1.6
Armstrong	3	0.7
Cambria	7	9.8
Fayette	1	0.2
Greene	6	11.7
Indiana	5	4.8
Somerset	1	0.3
Washington	10	12.4
Westmoreland	2	0.5
Total	39	42.0

Source: Irani, M. C., P. W. Jeran, and M. Deul. Methane Emission From U.S. Coal Mines in 1973. A Survey. A Supplement to IC 8558. Bureau of Mines IC 8659, 1974, 47 pp.

Coke.—Nine companies operated 12 oven coke plants having 3,376 slot-type ovens. Nine plants produced coke for blast furnaces, one plant produced both blast furnace coke and foundry coke, and two plants produced foundry coke only. Collectively, the plants received 23,273,102 short tons of bituminous coal having varied volatile-matter contents as follows:

Volatile matter content (weight percent)	Short tons
Plus 31.0	15,745,040
22.1 to 31.0	2,607,567
14.0 to 22.0	4,920,495
Total	23,273,102

Several of the plants also received 97,559 short tons of Pennsylvania anthracite. The origin of the bituminous coal receipts was—

State	Short tons
Pennsylvania	12,187,578
Eastern Kentucky	2,317,497
West Virginia	7,650,135
Virginia	1,117,815
Illinois	77
Total	23,273,102

The 12 plants carbonized 23,985,064 short tons of bituminous coal averaging $17.97 per ton and 17,756 short tons of anthracite averaging $14.95 per ton. The apparent decrease of coal in storage during the year was 711,962 short tons of bituminous coal and 25,197 tons of anthracite.

The production of coke and coke breeze and the yield based on the weight of coal mixtures carbonized follow:

Type	Production (short tons)	Yield (weight percent)
Blast furnace coke	15,385,702	NA
Foundry coke	551,982	NA
Coke for other industrial uses	772,423	NA
Coke breeze	884,980	3.67
Total (breeze free)	16,710,107	69.32

NA Not available.

The price of foundry coke f.o.b. ovens averaged $54.44 per ton. Output of the 12 plants accounted for 26.3% of the U.S. coke production.

Pennsylvania's coke plants also produced 254,748.6 million cubic feet (MMcf) of coke oven gas at an average yield of 10,567 standard cubic feet (scf) per ton of coal carbonized. The gas was distributed as follows: For heating ovens, 112,610.7 MMcf; used under boilers, 10,650.0 MMcf valued at $0.266 per thousand cubic feet (mcf); used in steel plants, 128,379.8 MMcf valued at $0.329 per Mcf; distributed to city gas systems, 977.4 MMcf valued at $0.166 per Mcf; sold for other industrial uses, 678.0 MMcf valued at $0.206 per Mcf; and unaccounted for 1,452.7 MMcf.

In addition, the 12 plants produced 202,762,053 gallons of tars, of which 144,606,142 gallons was used by the producing plants. Tar refiners purchased 66,298,886 gallons at an average price of $0.120 per gallon. Stocks of tars at yearend totaled 21,841,784 gallons.

Eight plants produced 117,536 short tons of ammonium sulfate from 12,995,087 tons of coal at an average yield of 18.16 pounds of ammonium sulfate per ton of coal carbonized.

Ten plants carbonizing 23,389,116 tons of coal produced 68,087,179 gallons of crude light oil at an average yield of 2.91 gallons per ton of coal carbonized. Two plants produced 777,040 gallons of intermediate light oil. Three plants produced 7,365,179 gallons of naphthalene. Three plants produced 51,580,740 gallons of nitration-grade benzene, 434,061 gallons of other industrial grades of benzene, 9,475,254 gallons of nitration grade toluene, and 1,914,460 gallons of all grades of xylenes. Four plants produced 1,714,535 gallons of all grades of solvent naphthas. Two plants produced 2,789,602 gallons of all other light-oil-based derivatives.

One beehive coke plant in Armstrong County and two beehive plants in Fayette County collectively carbonized 334,032 tons of coal, all of which came from Pennsylvania except 8,906 tons from West Virginia. The coal carbonized averaged $13.06 per ton in value at the ovens. Three beehive plants produced 191,518 tons of blast-furnace-grade coke having an average value of $29.56 per short ton. The plants also produced 1,600 tons of coke for other industrial uses that averaged $34.00 per ton in value. The yield of breeze-free metallurgical coke was 57.81% of the weight of coal carbonized.

Shenango, Inc., a major producer of foundry coke at Neville Island, increased the price of foundry coke f.o.b. ovens by $3 to $59.75 per ton on November 1 and to $61.75 per ton on December 13.

In late December, Koppers Co., Pittsburgh, agreed to lease and operate the Erie, Pa., byproduct coke plant and related facilities of Interlake, Inc.

Natural Gas Liquids.—The total production of natural gas liquids in only two producing counties was 17% less than in 1972, but its value was 5.2% greater.

Two natural gas processing plants, with a combined rated capacity of 5.0 MMcf and a daily average throughput of 2.9 MMcf, produced 3,000 gallons per day of propane, 1,500 gallons per day of normal butane, and 2,120 gallons per day of debutanized natural gasoline.[11]

Peat.—Nine operations in six counties reported a total production of 30,293 short tons, 30.9% more than in 1972. Lackawanna County was the leading producer, followed by Luzerne County. Other producing counties were Columbia, Erie, Law-

[11] Oil and Gas Journal. 1974 Survey of Gas-Processing Plants. V. 72, No. 27, July 8, 1974, p. 80.

rence, and Monroe. Sales totaling 27,802 short tons were 24.0% greater in weight and 28.4% greater in value. Sales averaged $14.77 per ton, 49 cents per ton more than in 1972. Bulk sales totaled 19,880 tons and averaged $12.67 per ton. Sales of packaged peat totaled 7,922 tons and averaged $20.02 per ton. The tonnage and average value of sales by type of peat were moss, 10,292 tons at $11.74 per ton in bulk, and 836 tons at $18.32 per ton packaged; reed-sedge, 9,302 tons at $13.33 per ton in bulk (no reed-sedge was sold packaged); humus, 286 tons at $24.59 per ton in bulk, and 7,086 tons at $20.22 per ton packaged.

Petroleum and Natural Gas.—The Bureau of Topographic and Geologic Survey, Oil and Gas Geology Division, reported that the production of crude petroleum decreased 5% compared with that of 1972. Pennsylvania-grade crude petroleum production totaled 3.2 million barrels valued at $18.4 million, with an additional 76,000 barrels of Corning-grade crude oil valued at $363,550. The latter was produced mostly in Crawford County from the Medina (Lower Silurian) Sandstone. The number of producing wells decreased from 32,596 in 1972 to 31,539 in 1973. Estimated proved recoverable reserves of crude oil at yearend totaled 39.6 million barrels, an increase of 2.9 million barrels from that of yearend 1972. Natural gas production totaled 78.5 billion cubic feet (Bcf), an increase of 6% from that of 1972, and averaged 42 cents per 1,000 standard cubic feet. A total of 66.7 Bcf of gas was produced from the shallow (Upper Devonian or younger) reservoirs, while production from the deep (Middle Devonian or older) reservoirs totaled 11.8 Bcf. The estimated number of producing gas wells increased to about 16,800 or 200 more than in 1972. Estimated proved reserves of natural gas totaled 1,494 Bcf, including 606 Bcf in storage at yearend. This was a total increase of 87 Bcf from that of 1972.

The Division also reported 1,099 new wells drilled and 47 wells deepened during 1973. Of these, 525 were oil wells, 484 gas wells, 9 oil and gas wells, 43 service wells, 12 gas storage wells, and 90 dry holes. Of the old wells drilled deeper, 32 produced gas, 2 produced oil, 2 were gas storage wells, and 11 were dry holes. Total footage of all wells (1,099) drilled was 2,689,454. Of 1,099 well completions, excluding service and gas storage wells, 99 were exploratory (44% successful) and 1,000 were development (96% successful), an increase in the number of wells of 50% and 20% respectively.

Table 20.—Pennsylvania: Oil and gas well drilling completions, by county

County	Proved field wells[1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Armstrong	--	43	3	--	--	--	46	152,583
Bedford	--	--	--	--	--	1	1	11,597
Bradford	--	--	--	--	--	2	2	15,337
Butler	2	2	--	--	--	--	4	7,009
Cambria	--	--	--	--	3	1	4	16,012
Cameron	--	--	2	--	2	1	5	33,396
Clarion	1	2	1	--	--	1	5	8,666
Clearfield	--	17	3	--	5	5	30	105,746
Crawford	6	2	1	--	1	--	10	37,621
Elk	2	9	3	--	3	7	24	68,180
Erie	--	--	3	--	2	1	6	18,224
Fayette	--	1	--	--	--	1	2	5,798
Forest	84	6	1	1	--	3	95	99,290
Fulton	--	--	--	--	--	1	1	3,572
Indiana	--	312	5	--	15	2	334	1,165,490
Jefferson	--	25	2	--	1	3	31	93,032
McKean	128	8	4	--	2	9	151	274,850
Mercer	1	1	--	--	--	1	3	11,899
Potter	--	--	1	--	--	5	6	39,460
Somerset	--	--	--	--	--	1	1	9,800
Susquehanna	--	--	--	--	--	1	1	8,534
Tioga	--	--	--	--	--	4	4	21,582
Venango	204	1	7	1	3	1	217	199,459
Warren	94	--	1	1	--	1	97	93,875
Washington	--	1	--	--	--	1	2	8,048
Westmoreland	--	13	--	--	4	--	17	55,841
Total	522	443	37	3	41	53	1,099	2,564,901

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Deep drilling (Middle Devonian or older) increased from 63 wells in 1972 to 69 wells in 1973, including 10 wells drilled deeper as in 1972, the majority of the deep development drilling was in the Medina gas area of Crawford County where two gas wells, five oil and gas wells, and one dry hole were drilled in the Indian Springs field. Two of the oil and gas wells had initial production rates of 30 barrels of oil per day of Corning-grade crude. Production of Corning-grade crude from the Medina wells amounted to 76,000 barrels, down 2,000 barrels from that of 1972. Most of the activity in the shallow gasfields was in the following counties: Indiana 312 wells, Armstrong 34, Jefferson 21, Clearfield 20, Westmoreland 14, McKean 9, and Elk 8. The majority of the shallow oil development was in the following counties: Venango—205 wells producing from the Red Valley and Venango Second sandstones, Warren—95 oil wells with Glade sand production, Forest—82 wells with production from the Red Valley and Venango Second sandstones, and McKean—126 wells producing from the Bradford and associated sandstones. Seismic activity was off 102 crew-weeks from that in 1972. Most of the seismic testing was Vibroseis. Seismic crews logged 161 crew-weeks costing operators over $2,400,000 during 1973, compared with 263 crew-weeks during 1972, a decrease of 39% in crew-weeks. The seismic surveys were made in Allegheny, Bedford, Blair, Bradford, Butler, Cambria, Cameron, Centre, Clarion, Clearfield, Clinton, Elk, Fayette, Jefferson, Lackawanan, Lycoming, McKean, Pike, Potter, Somerset, Sullivan, Venango, Washington, Wayne, Westmoreland, and Wyoming Counties.

The Pennsylvania Game Commission leased 13,744 acres in 1973 for the exploration or development of oil and gas. At the end of 1973 the Commission had 37 active leases totaling 22,796 acres. Forty-eight wells were producing on 30 of the above leases, and one dry hole was drilled. Through competitive bidding, 10 tracts of State Forest or Park lands were leased during 1973. The total bonus or first-year rental received for these tracts was $215,326. The average of all sales was $12.41 per acre. After the first year, the rental was $1 per acre per year with royalties equal to one eighth or more of all production. The income from oil and gas development on State Forest and Park lands totaled $617,414, including $123,032 in royalty payments and $494,382 for tract rentals, gas storage, right of ways, etc. At yearend, 249,408 acres (60,841 acres included for gas storage) of State Forest and Park lands were under lease for oil and gas exploration and development.

Active rotary-drill weeks totaled 578. Only six rotary drilling rigs were active in the week ending April 2. The maximum activity was in the week ending December 3 when 19 rotary drills were in operation.

The American Gas Association (AGA), reported that as of December 31, 1973 Pennsylvania had 68 dry gas reservoirs with a total capacity of 783.4 Bcf, equal to 12.4% of the U.S. gas storage reservoir capacity. At yearend these reservoirs, serviced by 2,141 wells, held 614.1 Bcf (14.73 psia and 60° F) of gas, or 15.7% of the U.S. total in gas storage reservoirs. In 1973, the 68 reservoirs received 343.4 Bcf, delivered 303.4 Bcf, and attained a net gain of 40.0 Bcf of gas stored.[12]

The average price of new gas at the wellhead was 45 cents per Mcf. Gas in some areas of northern Pennsylvania was purchased at 60 cents per Mcf at the wellhead.

Late in the year Pennsylvania-grade crude oil from new and stripper wells was priced at $10.65 per barrel in the Bradford district, $10.28 per barrel in the Middle district, and $10.13 per barrel in the Southwest district. Corning-grade crude oil from Crawford County sold for $10.00 per barrel.

Two Maraflood projects to stimulate crude oil recovery were operating, one in the oil-wet Bradford Third sandstone at a 1,800-foot depth in McKean County, and one in the water-wet First Venango sandstone at a 500-foot depth in Warren County.

Six deep wells were testing the Medina (Lower Silurian) Sandstone 6 miles southwest of Meadville. In Fayette County a deeper pool wildcat was testing the Tuscarora Sandstone (Medina) 8 miles south of Uniontown. A deeper pool test to the Upper Silurian was staked in McKean County 3 miles southwest of Clermont. In Potter County two wells were drilled to the "Oriskany-no-sand" area to test the Oriskany interval. Two wildcats in Somer-

[12] American Gas Association. The Underground Storage of Gas in the United States and Canada. Pub. XY0274, Dec. 31, 1973, 22 pp.

set County were being drilled to test the Oriskany. A third wildcat about 13.5 miles southeast of Connellsville was projected to drill to the Cambrian at 20,500 feet. Another Cambrian test was located in Tioga County about 2.5 miles southeast of Marshlands where the well was reamed at 3,517 feet before continuing drilling to 5,300 feet. A deeper pool wildcat near Franklin, Venango County, was drilled to 6,085 feet and was then tested after fracturing the Medina sandstone.

The American National Petroleum Co. reported a gas flow of 1.1 million cubic feet per day (MMcfd) from a new well in Elk County at a 2,282- to 2,560-foot interval from the Sheffield, First Bradford, and Second Bradford zones.

Westrans Petroleum Inc., a subsidiary of Westrans Industries Inc., completed a well in the Devonian sandstone in Armstrong County. The 7,310-foot well had a shut-in wellhead pressure of 3,950 psi and an initial flow rate of 7 MMcfd. After completion of a pipeline in February gas was marketed intrastate at about 50 cents per Mcf.

A Standard Oil Co. (Indiana) subsidiary, Amoco Production Co., completed a new well 10 miles northeast of Somerset in the Oriskany Sandstone in the interval from 8,636 to 8,670 feet. During an initial 18-hour test, the well produced 4.2 MMcfd of dry gas through an 18/64-inch choke. Amoco held leases on 3,000 acres in the immediate area and planned an offset well one-half mile southwest of the completed well to define the size of the discovery.

Equitable Gas Co. was readying a new underground gas storage reservoir in Greene County to start gas injection by midyear. The reservoir will provide the company with 1.75 Bcf of additional storage capacity. In late April, Equitable asked the PUC for a rate increase that would average 60 cents per month for each of its retail customers in Pennsylvania.

Philadelphia Electric Co. was given conditional approval by the PUC for a $12 million annual increase in natural gas rates effective February 15. The 13% average increase was the first by the company in 20 years.

A rate increase by Peoples Natural Gas Co., Pittsburgh, on October 11 with PUC approval, which amounted to $5.7 million annually, cost the average residential customer using gas for heating 90 cents per month, and cost nonheating customers 30 cents per month. The company served 298,000 customers in 16 Pennsylvania counties.

The Jeanette Corp., a glass manufacturer, asked the PUC to disregard the gas curtailment plan of the Peoples Natural Gas Co. The plan put 200 employees out of work, cut production by 16%, and threatened 100 more jobs.

Governor Shapp asked the PUC in November to relieve the Carnegie Natural Gas Co., Pittsburgh, of a curtailment of the gas it received from Texas Eastern Transmission Co. The request was based on an alarming decrease in ammonium nitrate production by Carnegie that reportedly caused a loss of some strip coal production.

On January 5 the FPC dismissed an application by Transco Energy Co., Houston, Tex., to build an $85 million synthetic natural gas (SNG) plant at Twin Oaks, Delaware County. FPC planned to examine in a formal hearing the end uses of the mixture of SNG and natural gas that the company proposed to market.

The PUC gave approval to Interstate Energy Co., Houston, Tex., a subsidiary of Gulf Interstate Co., Houston, Tex., to build a $45 million, 82-mile pipeline to link Interstate's terminal at Marcus Hook with PPL's Martins Creek steam-electric plant under construction near Easton. The line will transport low-sulfur-content residual oil or crude petroleum.

The Philadelphia Electric Co. was constructing a $11 million liquefied natural gas (LNG) peak-shaving facility at West Conshohocken.

Pennsylvania's LPG underground storage capacity totaled 1,061,000 barrels.[13]

ARCO at its Philadelphia refinery in late 1972 installed the first gasoline-vapor recovery unit of its type on the east coast. The skid-mounted system used oil as absorbent at a low pressure thereby avoiding the hazardous compression of vapors, to recover about 1,000 gallons of gasoline per day. Also scheduled for completion by September 1973 was a new 57,000-barrel-per-day (bpd) vacuum tower integrated to a 125,000-bpd crude still whose capacity

[13] Oil and Gas Journal. LP–Gas Underground Storage Capacity. V. 71, No. 33, Aug. 13, 1973, p. 62.

had been increased from 95,000 bpd; a 20,000-bpd heavy-gas-oil hydrodesulfurizer; a 41,000-bpd distillate desulfurizer; and a Claus sulfur-recovery plant having two parallel sections each producing 70 long tons per day. In 1972, a new 30,000-bpd catalytic Magnaformer started operation at the refinery.

BP Oil Corp., a Sohio subsidiary, in mid-February announced a $120 million modernization of its Marcus Hook refinery, including $70 million for pollution control equipment. The modifications will bring the crude-throughput capacity to 150,000 bpd and will meet all Federal and State pollution regulations, including those for noise pollution, effective in 1975. The modernization will provide for product improvements, the production of lead-free gasoline, and the desulfurization of distillate fuels oils. BP in early 1973 contracted with Foster-Wheeler Corp. for a Universal Oil Products Co. HF alkylation process unit to produce 8,000 bpd of high-octane motor alkylate, with provision for the removal of gaseous hydrofluoric acid from a flare system by the use of lime, and a separate pond to handle cooling water from the unit.

Gulf Oil Co.'s Philadelphia refinery was constructing a 15,000-bpd HF alkylation unit. On November 19, Sun Oil Co. increased the prices of residual fuel oil by amounts ranging from 34% to 38% for No. 4, No. 6 regular grade, and No. 6 with 1% maximum sulfur content, f.o.b. Pennsylvania terminals. Sun Oil was constructing a 13-MMcfd refinery-gas-recovery unit at Marcus Hook. United Refinery Co., Warren, completed a 30,000-bpd electric desalter, increased crude distillation capacity to 30,000 bpd, and completed a catalytic reformer.

Capacities of 11 refineries operating in Pennsylvania as of January 1, 1974, are shown in table 21.

Table 21.—Pennsylvania: Capacities of operating refineries, January 1, 1974

	Western Pennsylvania		Eastern Pennsylvania	
	Pennsylvania grade crude oil	Interstate and foreign crude oil	Interstate and foreign crude oil	Total
Number of refineries	6	1	4	11
Crude capacity:				
Barrels per calendar day	35,120	38,000	616,500	689,620
Barrels per stream day	37,215	38,000	654,000	729,215
Charge capacity, barrels per stream day:				
Vacuum distillation	9,778	8,000	230,000	247,778
Thermal operations	2,750	--	24,000	26,750
Catalytic-cracking, fresh feed	--	10,000	186,900	196,900
Catalytic-cracking, recycle	--	200	20,500	20,700
Catalytic reforming	8,208	10,000	179,000	197,208
Catalytic hydrocracking	2,700	--	30,000	32,700
Catalytic hydrorefining	--	--	133,000	133,000
Catalytic hydrotreating	10,250	16,500	201,000	227,750
Alkylation	--	1,400	36,700	38,100
Production capacity, barrels per stream day:				
Aromatics isomerization	--	--	57,900	57,900
Lubricants	12,628		17,000	29,628
Asphalt	--	4,000	31,500	35,500

Source: Cantrell, A. Annual Refinery Survey. Oil and Gas Journal, v. 72, No. 13, Apr. 1, 1974, pp. 82, 84, 100.

The 1973 consumption of gasoline in Pennsylvania was 4,874,673,000 gallons, 1.3% more than in 1972.

Near Bradford, the Bureau of Mines installed a microseismic monitoring system employing explosive charges detonated at various locations to obtain directional acoustic velocity data in the strata to guide the development of a fracture-mapping technique to achieve better reservoir performance.

NONMETALS

Abrasives.—Silicon carbide abrasives were produced by Satellite Alloy Co., Alle-

gheny County. On April 3, the Allegheny County Air Pollution Appeals Board demanded that the firm control its emission of sulfur dioxide. The plant employed 41 persons and reportedly was 1 to 3 plants in the United States producing silicon carbide abrasives for use in steelmaking, electronics, refractories, heating elements, and marble and granite cutting.

Four companies in three counties produced metallic abrasives consisting of steel shot and grit and chilled iron shot and grit. Because one company in Pittsburgh produced no metallic abrasives during 1973 but did sell both chilled and annealed iron shot and grit, total sales in the State exceeded total production by 8,651 short tons.

Cement.—Portland cement shipments from 19 plants in 8 counties were 4.2% greater in quantity and 10% greater in value than in 1972. The average increase of value was $1.05 per short ton greater than in 1972. Masonry cement shipments from 15 plants in 8 counties were 8.6% greater in quantity and 16.5% greater in value than in 1972. The average value of masonry cements was $1.98 per short ton greater than in 1972.

Northhampton and Lawrence Counties were the largest producers of both portland and masonry cements. Of the 15 plants in Berks, Lehigh, Montgomery, Northampton, and York Counties, four performed wet grinding, nine performed dry grinding, and two performed dry grinding only on clinker received from out-of-plant sources. Of the five plants in Allegheny, Butler, and Lawrence Counties, three performed wet grinding and two performed dry grinding.

The 15 plants in 5 eastern counties ground 5,923,471 short tons of clinker in equipment rated at 7,132,000 short ton's annual capacity. The five plants in three western counties ground 2,371,151 short tons of clinker in equipment rated at 2,836,000 short ton's annual capacity.

Methods and tonnages of shipments of portland cement from terminals to consumers and from plants to consumers in short tons follow:

	Shipments (thousand short tons)	
	Bulk	Container
Transport method:		
Rail	1,640,312	134,008
Truck	6,243,936	1,047,968
Barge	123,662	--
Total	8,007,910	1,181,976

Disposition of portland cement by type of customer was—

	Percent
Ready-mix concrete companies	59
Concrete products manufacturers	22
Building material dealers	10
Contractors and other uses	9

Consumption of energy for the 20 producing plants was—

Natural gas, cubic feet	630,424,000
Fuel oil, 42-gallon barrels	1,127,000
Bituminous coal, short tons	1,471,000
Anthracite, do	118,000
Electricity generated, kilowatt-hours	24,062,000
Electricity purchased, do	1,161,651,000

Total stocks of cements in short tons at producing plants were—

	Portland	Masonry
Dec. 31, 1972	621,900	42,132
Dec. 31, 1973	534,618	38,612

Whitehall Cement Manufacturing Co. awarded a $650,000 contract to the Fuller Co. to supply pyroprocessing equipment for Whitehall's Cementon, Pa., plant expansion. Fuller will supply a 250,000-ton-per-year kiln and clinker cooler system. The four-stage preheater was manufactured at Fuller's Catasaqua, Pa. plant and the 12-by-65-foot kiln and clinker cooler will be fabricated at Fuller's Allentown, Pa., plant. Kaiser Engineers was in charge of the $9 million program that included an A-frame clinker storage building, homogenizing silos, and a 3,500-hp finish mill. An existing control computer system will be extended to the new kiln and mill.

Early in 1973 limited production started at the Egypt, Pa., plant that Coplay Cement Manufacturing Co. acquired from Giant Portland Cement Co. in 1972. Reportedly the capacity of the Egypt plant was increased to 2.5 million barrels per year (470,000 short tons).

Clays.—Total production of common clay and shale, excluding kaolin, and fire clay was 13% greater in tonnage but was only 10% greater in value than in 1972, because of a $0.19 decrease in average value to $5.60 per ton. Common clay and shale accounted for 70.0% of the total tonnage and 33.6% of the value of all clays and shales, excluding kaolin. Thirty companies in 26 counties produced common clay and shale and 29 companies in 8 counties produced fire clay. Common clay and shale averaged $2.68 per ton, and fire clay averaged $12.41 per ton. Two companies produced 30.9% of the common clay and shale, and two companies pro-

duced 30.2% of the fire clay. Table 22 shows the tonnages of clays sold or used by producers, by use, for 1972 and 1973.

Medusa Corp. produced unprocessed kaolin in Cumberland County, and Narbon Mining and Chemical Corp. produced calcined kaolin in Lancaster County.

Table 22.—Pennsylvania: Clays sold or used by producers, by use
(Short tons)

Use	1972	1973[1]
Common brick	412,384	238,078
Face brick	1,024,822	1,378,052
Firebrick, block, and shapes	639,205	750,534
Flue linings	W	52,236
High alumina refractories	37,269	W
Brakes clutches, and linoleum	1,748	1,858
Lightweight aggregate	72,500	80,000
Mortar and cement, refractory	43,728	14,286
Portland and other cements	273,181	224,532
Pottery	--	490
Sewer pipe	95,274	98,892
Drain, quarry, and structural tile	33,292	29,234
Other[2]	29,828	41,706
Exports:		
Face brick	--	28,171
Refractories	9,486	8,949
Brick and glazed tile	8,834	--
Sewer pipe	--	28,170
Total	2,681,551	2,975,188

W Withheld to avoid disclosing individual company confidential data; included in "Other."
[1] Excludes kaolin.
[2] Includes animal feed (1972), paint (1972), pesticides and related products (1972), refractory grogs and crudes, rubber (1972), terra cotta (1973), water treatment (1972), and data indicated by symbol W.

Shales and clays of western Pennsylvania were discussed.[14]

Gem Stones and Minerals.— A large beryl crystal from Chester County was donated to the William Penn Memorial Museum in Harrisburg.

The following mineral species were verified as new minerals occurring in Pennsylvania: Acanthite, anatase, berndite, bitsmuthite, brookite, cassiterite, cornubite, epsomite, herzenbergite, hexahydrite, langite, mascagnite, ottemannite, posnjakite, realgar, selenium, and selenolite. None are presently economic.

Mineral collectors obtained representative specimens of wavellite, cacoxenite, sphalerite, galena, celestite, barite, cobaltite, arsenopyrite, millerite, sulfur, selenium, tschermigite, and quartz. Sales of these and other minerals increased in the past few years.

Graphite (Synthetic).—Three companies produced synthetic graphite using petroleum coke, lampblack, pitch, black oil, and natural gas as the principal raw materials. Principal uses for the synthetic graphite were for carbon raisers, and for machined and rough shapes. Compared with 1972, production was 7.8% less, but value was 15.6% greater.

Gypsum.—U.S. Gypsum Co. calcined gypsum at Philadelphia. Output was 14% greater than in 1972, and value was 24% greater.

Kyanite.—Combustion Engineering Inc., Stamford, Conn., commenced expansion of its Washington, Pa., kyanite facilities, which will increase the processing of kyanite by more than 30,000 tons per year.

Lime.—Nine plants in seven counties produced 2,260,000 total tons of burned and hydrated lime, 19.5% more than in 1972. Value of the total production was 21.1% more than in 1972. The average value of all production in 1973 was $18.11 per short ton, 24 cents per ton more than in 1972. Pennsylvania ranked second in the United States with 10.7% of the total production and 11.1% of the total value. Centre County was the leading producer in the State with 34.3% of the total production and 30.67% of the total value.

[14] Williams, E. G., R. R. Holbrook, E. W. Lithglow, and B. R. Wilson. Properties and Occurrence of Bloating Clays and Shales in the Pennsylvanian of Western Pennsylvania. AIME Preprint 73-H-336, September 1973, 12 pp.

Table 23.—Pennsylvania: Lime sold or used by producers, by use

Use	1972		1973	
	Quantity (short tons)	Value	Quantity (short tons)	Value
Steel, b.o.f.	851,800	r $14,250,000	1,219,000	$21,050,000
Water purification	181,300	3,033,000	241,400	4,169,000
Mason's lime	r 80,260	r 1,768,000	106,100	2,061,000
Steel, electric	79,360	r 132,800	100,200	1,730,000
Sewage treatment	72,080	1,206,000	95,330	1,646,000
Steel, open-hearth	r 190,700	r 3,190,000	84,720	1,463,000
Agriculture	70,520	1,313,000	63,420	1,189,000
Acid mine water	34,950	584,700	41,000	708,100
Finishing lime	r --	--	26,940	521,000
Paper and pulp	22,210	371,600	26,290	454,000
Tanning	6,116	r 102,300	W	W
Other [1]	r 302,100	r 7,851,000	255,600	5,959,000
Total [2]	1,891,000	33,802,000	2,260,000	40,950,000

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Total".

[1] Includes refractory dolomite, insecticides, other metallurgy, sand-lime brick, explosives, wire drawing, silica brick, other ore concentration, petroleum refining, food, paint, alkalies, other chemical uses, soil stabilization (1972), and uses indicated by symbol W.

[2] Data may not add to totals shown because of independent rounding.

Mica.—Micalith Mining Co., Inc., at its Hokes mine near Glenville, York County, mined crude mica from a deposit in schist. The dry ground product was used in the manufacture of paints and welding rods. Production was less than in 1972 but its value was greater.

Aguda Mining Corp. Pittsburgh, planned a wet grinding plant to process mica near Lancaster from a purported 35-million-ton deposit.

Mullite.—The Remmey Div., A.P. Green Refractory Co., produced high-temperature sintered synthetic mullite at a plant in Philadelphia County. Compared with 1972, production was 26.5% less and value was 34.6% less.

Perlite.—Crude perlite was shipped into the State and expanded at seven plants by seven companies operating in seven counties. Production totaled 36,490 short tons. The quantity sold or used was 35,230 short tons, with an average value of $58.33 per short ton. Principal uses for the product were for plaster, horticulture, and cement aggregates. Minor uses for filter aid, low-temperature insulation, fillers, foundry uses, insulating board, formed products, castable insulation, and bonding mortars.

Sand and Gravel.—On August 17, the Environmental Quality Hearing Board ruled against DER restrictions preventing dredging on holidays and weekends, or in areas within 50 feet of the shoreline.

In the 1973 National Sand and Gravel Association safety contest covering the period from July 1, 1972, to June 30, 1973, recipients of Certificates of Achievement were the New Freedom plant of George F. Pettinos, Inc., Ardmore; and the Amity Hall plant of Pennsylvania Supply Co., Harrisburg.

Compared with 1972, the total production of sand and gravel increased 9.6% and its value increased 16.4%. The average increase in value was 12 cents per short ton. The production by 81 companies in 39 counties came from 84 stationary plants, 19 portable plants, 16 dredges, and 3 plants using unspecified types of equipment.

Table 24.—Pennsylvania: Sand and gravel sold or used by producers, by class of operation and use
(Thousand short tons and thousand dollars)

Class of operation and use	1972		1973	
	Quantity	Value	Quantity	Value
Commercial operations:				
Sand:				
Building	5,164	9,265	5,366	10,747
Fill	100	129	123	182
Paving	2,441	4,649	3,625	7,293
Other uses [1]	3,384	8,247	3,386	8,840
Total [2]	11,090	22,291	12,500	27,062
Gravel:				
Building	3,992	7,389	4,520	8,862
Fill	340	301	462	463
Paving	2,866	5,940	2,718	5,790
Miscellaneous	363	747	377	653
Other uses	106	137	(3)	(3)
Total [2]	7,667	14,513	8,077	15,767
Total sand and gravel [2]	18,757	36,804	20,576	42,830

[1] Includes blast, engine, filtration, fire and furnace, foundry, glass, grinding and polishing, molding, oil (hydrafrac), abrasives, chemical, enamel, filler, pottery, and other uses.
[2] Data may not add to totals shown because of independent rounding.
[3] Included with miscellaneous gravel.

Stone.—Compared with 1972, production was 16.7% greater and value was 18.1% more because of an average increase in value to $1.91 per ton from $1.89 per ton in 1972.

Dimension stone from 31 quarries accounted for 0.13% of the total tonnage and 3.19% of the total value. The average price of all dimension stone was $45.77 per ton, compared with $51.60 per ton in 1972.

The average price of all crushed and broken stone production at $1.85 per ton was 7 cents greater than in 1972. Limestone accounted for 74.3% of the tonnage and 73.6% of the value of all crushed and broken stone production; traprock accounted for 7.8% of the production and 6.7% of the value; and dolomite, granite, quartzite, sandstone, and other stone, collectively, accounted for 17.9% of the tonnage and 20.4% of the value. Crushed and broken stone was produced at 231 quarries.

Rock dust for use in underground coal mines was produced at seven locations. The 135,243-ton production averaged $5.25 per ton at the producing sites.

Michigan Limestone Co., a subsidiary of U.S. Steel, abandoned a 3-square-mile area at Hillsville in Lawrence County, where unregulated strip mining of limestone had been done for 50 years.

Eureka Stone Quarries at Milford, Pike County, installed a 1,000-ton-per-hour hydraulic impulse breaker.

New Enterprise Stone & Lime Co. started an automatic central mix plant at its Roaring Spring quarry. The new plant had a 9-cubic-yard mixer capable of producing 300 cubic yards of concrete per hour.

A 6-cubic-yard tracked wheel loader replaced two 2.5-cubic-yard shovels for loading shot rock at the Pennsylvania Supply, Inc., Hummelstown quarry. Loading time was reduced by 50%.

The Rock Hill operation of General Crushed Stone Co. near Quakerstown was revamped to get the maximum production of finer sizes in the 5/16- by 3/16-inch range with at least 85% in the minus ¼-inch specification. The operation was the first of the firm's Pennsylvania operations that could deliver tertiary reduction products as a major output.

Table 25.—Pennsylvania: Stone sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1972			1973			Kind of stone produced in 1973
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Allegheny	--	--	--	3	W	1,122	Limestone, sandstone.
Armstrong	4	173	397	5	174	478	Limestone.
Berks	12	4,649	6,377	16	5,352	7,983	Limestone, standstone, traprock.
Blair	8	1,213	2,164	7	1,368	2,559	Limestone, dolomite, quartzite.
Bucks	20	4,929	7,631	15	5,026	9,902	Limestone, sandstone, traprock.
Butler	7	1,592	3,894	7	2,004	5,111	Limestone, sandstone.
Carbon	3	101	W	2	W	W	Limestone, quartzitc.
Centre	9	2,537	4,245	9	2,830	6,226	Limestone.
Chester	7	3,536	5,903	8	4,137	7,311	Limestone, sandstone, traprock, quartzitè.
Clarion	3	220	W	4	302	789	Limestone, sandstonc.
Cumberland	6	1,758	2,998	7	1,947	3,465	Do.
Dauphin	4	1,659	2,667	7	2,630	3,957	Do.
Huntingdon	5	667	1,236	5	764	1,510	Limestone, quartzite.
Juniata	1	242	366	1	275	432	Limestone.
Lancaster	17	4,350	7,974	7	5,696	10,883	Limestone, dolomite, other.
Lawrence	4	2,095	3,470	5	1,505	2,622	Limestone.
Lehigh	9	2,215	3,450	9	2,631	4,106	Limestone, slate.
Luzerne	4	669	1,072	4	1,039	1,713	Sandstone.
Montgomery	15	5,182	9,592	14	7,156	13,728	Limestone, sandstone, dolomite, granite, traprock, other.
Northampton	17	6,020	11,388	18	5,757	10,912	Limestone, quartzitc, slate.
Northumberland	2	W	W	3	480	1,029	Limestone, sandstone.
Potter	3	1	29	3	1	30	Sandstone.
Schuylkill	3	W	670	3	W	W	Limestone, sandstone, quartzite.
Somerset	4	874	2,101	5	690	W	Limestone, sandstone.
Susquehanna	7	W	661	7	W	724	Sandstone.
Westmoreland	10	1,758	3,657	8	2,178	4,951	Limestone, sandstonc.
York	10	4,410	9,537	10	4,461	10,339	Limestone, sandstone, dolomite.
Undistributed [1]	52	16,454	32,861	53	20,162	38,461	Limestone, sandstone, quartzite, traprock, other stone.
Total [2]	247	67,307	124,340	255	78,564	150,346	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Adams, Bedford, Cambria, Clinton, Columbia, Delaware, Elk, Fayette, Franklin, Fulton, Greene (1973), Lackawanna (1973), Lebanon, Lycoming, McKean, Mercer, Mifflin, Monroe, Montour, Perry, Snyder, Union, Washington, Wayne Counties, and production for which there was no county breakdown.

[2] Data may not add to totals shown because of independent rounding.

Table 26.—Pennsylvania: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1972		1973	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone [1]	49	836	59	895
Curbing and flagging	21	542	22	634
Other uses [2]	22	3,318	23	3,277
Total [3]	91	4,696	105	4,806
Crushed and broken stone:				
Bituminous aggregate	6,125	10,860	7,476	15,113
Concrete aggregate	8,740	13,997	7,151	12,860
Dense graded roadbase stone	15,346	25,346	20,308	33,955
Macadam aggregate	2,018	3,969	1,624	2,960
Surface treatment aggregate	3,321	5,240	3,333	5,001
Unspecified construction aggregate and roadstone	7,404	13,024	11,540	21,759
Agricultural purposes [4]	1,064	3,456	2,345	6,988
Cement manufacture	11,106	14,678	12,045	16,685
Fill	118	94	--	--
Filter stone	W	W	236	W
Flux stone [5]	3,405	7,278	4,087	9,357
Glass	115	434	90	W
Lime manufacture	2,752	5,361	3,634	8,443
Manufactured fine aggregate (stone sand)	444	1,052	427	1,167
Mineral fillers, extenders, and whiting	508	2,667	728	3,092
Railroad ballast	1,500	2,564	1,738	2,944
Refractory stone	179	1,316	W	W
Riprap and jetty stone	676	1,393	956	1,813
Special uses and products [6]	154	769	141	754
Other uses [7]	2,240	6,146	601	2,648
Total [3]	67,216	119,644	78,459	145,540
Grand total	67,307	124,340	78,564	150,346

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes rough blocks, rough construction stone, cut stone, house stone veneer, and dressed construction stone.
[2] Includes roofing slate, millstock, flooring slate, and other uses not specified.
[3] Data may not add to totals shown because of independent rounding.
[4] Includes agricultural limestone. 1973 data also include agricultural marl and other soil conditioners and poultry grit.
[5] 1973 data include dead-burned dolomite.
[6] Includes mine dusting and abrasives.
[7] Includes acid neutralization stone and other uses not specified. 1972 data also include dead-burned dolomite, roofing aggregates, poultry grit, and building products.

Sulfur.—Three petroleum refineries operated by three companies in Delaware and Philadelphia Counties produced 24,518 long tons of sulfur (100% basis) and sold 25,105 long tons of sulfur (100% basis). Stocks of sulfur decreased from 1,555 long tons on January 1 to 968 long tons at yearend. Compared with 1972, sales of recovered elemental sulfur increased 13.3% in tonnage, while value decreased 13.4%.

Vermiculite (Exfoliated).—Crude vermiculite shipped into the State was exfoliated by four companies operating in four counties. Total production exceeded that of 1972 by 2.9%. The total quantity sold or used by producers was 9.1% greater than in 1972, and its value was 19.1% greater. The major uses of the product was for loose fill insulation and concrete aggregates.

Tripoli (Rottenstone).—Crude tripoli was mined and processed by Keystone Filler & Manufacturing Co., Lycoming County. Compared with 1972, the tonnage sold or used was 6.9% greater and its value was 4.3% more.

METALS

Aluminum.—Aluminum Co. of America (Alcoa) in July signed a contract with the Group for Recycling in Pennsylvania (GRIP) to purchase scrap aluminum from GRIP's centers in southwestern Pennsylvania. About 1,000 pounds per month was transferred to the Alcoa Technical Center for use in a program to develop improved recycling techniques.

Beryllium.—Kawecki Berylco Industries Inc. (KBI) shut down its beryl operation at Hazleton, where beryllium beads had been produced. The prospect of spending more than $1 million for liquid and solid waste treatment systems was a major factor in the decision to cease operation. About 85 to 100 workers were affected. After nine months of litigation the Occupational Safety and Health Review Commission on August 13 accepted a plan for reducing airborne beryllium at KBI's Hazleton plant within 4 to 13 months. KBI installed annealing furnaces in its Reading plant to increase beryllium strip capacity by 30%.

Cadmium.—Smelter production of cadium was 28% less than that of 1972 but its value was 2.2% greater.

Iron Ore.—Bethlehem Steel Corp. pro-

duced iron ore at its Grace underground mine in Berks County and at its Cornwall open pit in Lebanon County. Except for a minor tonnage, all concentrates were pelletized prior to shipment to Bethlehem's steelmaking facilities. Production of pellets was 0.8% less in 1973 than in 1972, but their value was 2.7% greater. On July 2, 1973, the Cornwall mine was closed following many years of operation by Bethlehem and predecessor companies. No pyrites were produced from any of the iron ore mined in 1973. Minor tonnages of chalcopyrite were produced from the ore mined at both the Cornwall and Grace mines. Explosives consumed at the Grace mine comprised 500,230 pounds of dynamites and 178,000 pounds of Nylite #303.

Iron Oxide Pigments.—The total tonnage of natural and manufactured iron oxide pigments sold was 10.4% less than in 1972, but the total value of these products was 11.0% greater.

Iron and Steel.—According to the American Iron and Steel Institute (AISI), the State's raw steel production was 33,925,000 short tons, compared with 30,416,000 short tons in 1972. Total blast furnace production of pig and silvery irons and ferralloys was 23,028,000 short tons, 10.5% more than in 1972. Blast furnace production of ferroalloys was 382,000 short tons, compared with 483,000 short tons in 1972.

Active blast furnaces numbered 32 on January 1 and 36 at yearend. Idle blast furnaces totaled 23 on January 1 and 18 at yearend. The average net consumption of blast furnace coke plus a minor tonnage of coke breeze was 1,135 pounds per short ton of hot metal, 50 pounds less than the national average. Supplemental fuels injected into blast furnaces through tuyeres comprised 1,714 MMcf of natural gas, 33,364,685 gallons of bunker C oil, 26,308,665 gallons of No. 6 and high-sulfur oils, and 4,489,429 gallons of crude coal tar. On a Btu-basis, all supplemental fuels injected into blast furnaces through tuyeres equaled approximately 450,000 short tons of 90% carbon coke.

Blast furnace pig iron plus hot metal was classed as 94.6% basic, 3.1% Bessemer, and 2.3% malleable and foundry. Stocks of pig iron at furnaces totaled 170,636 tons on January 1 and 184,270 tons at yearend. Shipments of pig iron and hot metal for sale, transferred for interplant consumption, and withdrawn from stock during 1973 totaled 22,685,783 tons and averaged $76.08 per ton in value. Stocks of agglomerates totaled 2,132,825 tons on January 1 and 1,819,432 tons at yearend. Stocks of iron ore were 9,233,183 tons on January 1 and 7,593,679 tons at yearend.

Consumption of materials for the production of 33,925,000 tons of raw steel in Pennsylvania in 1973 is shown in table 27.

Table 27.—Pennsylvania: Material consumption for raw steel production
(Short tons)

Material	Agglomerating plants	Blast furnaces	Steel furnaces	Total
Iron ores:				
Nonmanganiferous:				
U.S.	2,727,418	6,149,479	7,110	8,884,007
Foreign	9,798,817	3,717,568	551,568	14,067,953
Manganiferous:				
U.S.	--	2,782	--	2,782
Foreign	3,207	88,585	--	91,792
Total	12,529,442	9,958,414	558,678	23,046,534
Sinter, regular	--	4,042,005	4,055	4,046,060
Sinter, flux	--	11,177,722	--	11,177,722
Pellets, regular	--	7,398,162	55,049	7,453,211
Agglomerates, foreign	--	2,689,170	31,907	2,721,077
Total	--	25,307,059	91,011	25,398,070
Fluxes:				
Limestone	1,576,599	1,134,324	594,569	3,305,492
Burnt lime	--	--	986,346	986,346
Dolomite	1,123,147	1,136,270	436,206	2,695,623
Fluorspar	--	--	101,064	101,064
Other fluxes	113,820	199,748	309,084	622,652
Total	2,813,566	2,470,342	2,427,269	7,711,177
Other Materials:				
Mill cinder and roll scale	1,041,855	351,891	23,263	1,417,009
Flue dust, raw	635,254	74,369	--	709,623
Slag (open hearth, basic oxygen, and bessemer)	431,631	698,093	--	1,129,724
Coke, breeze-free	--	13,461,618	--	13,461,618
Coke, breeze	785,518	67,525	--	853,043
Anthracite, Pennsylvania	215,462	67,500	1,232	284,194
Pig iron and hot metal	--	392,518	20,830,955	21,223,473
Total	3,109,720	15,113,514	20,855,450	39,078,684
Scrap:				
Home and purchased	--	1,393,823	11,909,268	13,303,091
Slag scrap	--	63,688	48,578	112,266
Other	--	600	265,858	266,458
Total	--	1,458,111	12,223,704	13,681,815
Grand Total	18,452,728	54,307,440	36,156,112	108,916,280

Total annual capacity of continuous hot-dip galvanizing lines operated by six companies in Pennsylvania was 968,000 short tons.[15] The annual capacity of oxygen-steelmaking (LD) vessels in Pennsylvania in 1973 is shown in table 28

[15] Metal Bulletin Monthly. Continuous Hot-Dip Galvanizing Lines. No. 38, February 1974, pp. 15–16.

Table 28.—Pennsylvania: Oxygen steelmaking capacity in Pennsylvania in 1973

Operator	Location	Vessels		Startup date	Rated annual capacity (thousand tons)
		Number	Capacity (tons)		
Alan Wood Steel Co	Conshohocken	2	150	1968	1,250
Allegheny Ludlum Steel Corp	Natrona	2	80	1966	500
Bethlehem Steel Corp	Bethlehem	2	270	1968	2,500
Crucible, Inc	Midland	2	105	1968	900
Jones & Laughlin Steel Corp	Aliquippa	2	80	1957	1,000
United States Steel Corp	Duquesne	2	220	1963	2,600
Do	Braddock	2	230	1972	2,250
Wheeling-Pittsburgh Steel Corp	Monessen	2	200	1964	1,800
Total or average	--	16	167	--	12,800

Source: Iron and Steel Engineer. World-wide Oxygen Steelmaking Capacity—1973. V. 51, No. 3, March 1974, p. 62.

According to American Metal Market,[16] steelmaking in the Pittsburgh area was at 97% to 98% of full capacity and was 17% to 20% more than the 1967 average. The rate of steel production in both April and October was 35 million tons annually.[17]

There were few, if any, cutbacks in steelmaking because of lack of furnace melting scrap. More scrap was available as prices advanced during the year. For example on November 8, some buyers in the open market paid $79 per gross ton for No. 1 heavy melting grades, No. 1 dealer bundles brought $92 per gross ton, and rails and railroad specialties were $80 to $95 per gross ton, up from $57 in April. On November 1, Allegheny Ludlum Steel applied a surcharge on its products based on an increase of 75 cents per ton for each $1 increase in the price of its railroad specialty scrap purchases in excess of the April 1 price. The surcharge for each following month was based on the price published in the American Metal Market for the last of the preceding month.

Most Pennsylvania producers followed U.S. Steel's posting of higher prices effective June 15 on sheet and strip steel. Wheeling-Pittsburgh's cold rolled strip advanced $12 per ton, and its electrogalvanized sheet increased $14 per ton. U.S. Steel's price hikes included $8 per ton of hot-rolled sheet and hot-rolled band, $9 per ton of hot-rolled strip and cold-rolled strip, $10 per ton of Vitronamel sheet, $11 per ton for galvanized sheet including corrugated sheet, and $12 per ton for terne sheet. On August 1, U.S. Steel boosted prices on large-diameter welded pipe.

In early spring, seven Pennsylvania producers of high-alloy and regular grades of tool and die steels announced a 6% price increase on both base prices and extra charges.

Alan Wood Steel Co., Conshohocken, completed the replacement of goosenecks, was converting drives on gas exhausters, was modifying larry cars for staged-coal charging, and installed steam lines to service the ascension pipes on its coke ovens. One of the company's two blast furnaces was damaged in early September when, reportedly, molten metal contacted cooling water. The Eichleay Corp., Pittsburgh, received a contract to rebuild and reline a blast furnace at an estimated cost of $3 million. The contract also included the installation of a McKee-type revolving distributor in the furnace and a variable-throat wet scrubbing system for cleaning blast furnace gas. The furnace's hearth diameter was to be increased 1 foot to 19 feet. The project was to start early in 1974 and be completed in 2 months. An oil preheater system was completed in the basic oxygen furnace (BOF) shop, and work was in progress on a coke plant waste-ammonia-disposal system.

Allegheny Ludlum Industries, Brackenridge, started operation of a waste water treatment facility at its Bagdad plant in Leechburg, Armstrong County. In January, Allegheny-Ludlum was ordered to submit an acceptable plan for controlling emissions resulting from the processing of steel slag wastes and from dust resulting from the hauling and dumping of slag produced at the Brackenridge Works. The firm also investigated the use of oxygen-lance cutting torches to eliminate dust and fumes. In September, the firm started operation of a new heat-treating line for the annealing of silicon electrical steel and for covering the steel with a glasslike coating.

The Tubular Products Div., Babcock & Wilcox Co., produced forging-quality alloy steel bars in new grades and sizes, in electric arc furnaces. The bars were available in 46 thicknesses ranging from 2.25 to 8.50 inches and in 26 sizes of round-cornered squares ranging from 4 to 14 inches. In early May, B & W announced plans for a $44.8 million expansion program which included a new seamless tube mill at Ambridge. The expansion will increase the capacity of the Tubular Products Division from 500,000 tons to 700,000 tons per year. By mid-August, a new argon-oxygen-desulfurization system (AOD) for stainless and high-alloy grades of steel was scheduled to start operation in the Wallace Run No. 1 electric furnace shop. In September, B & W completed a $7.2 million expansion program to increase the production of cold-drawn steel tubing at its Beaver Falls plant.

In June, Bethlehem announced plans to phase out open-hearth furnaces at Johnstown by mid-1977, and to replace

[16] American Metal Market. V. 80, No. 51, Mar. 14, 1974, p. 4; v. 80, No. 188, Sept. 26, 1973, p. 4; v. 80, No. 192, Oct. 3, 1973, pp. 4–5; v. 80, No. 207, Oct. 25, 1973, p. 4.

[17] Pennsylvania Business Survey. State Economy Sets New Records. V. 12, December 1973, pp. 1–2.

them with an electric furnace shop costing $35 million. The prospect of spending an estimated $100 million for pollution-control equipment played a major part in the decision. The company's present steelmaking capacity of 2.3 million tons per year would be cut to 1.0 million tons in 1977. The plan would phase out all eight 180-ton-capacity open hearths, three of four blast furnaces, three batteries of coke ovens, and numerous semifinishing and finishing operations. On completion of the $87 million program, employment would drop to 7,100 from 11,800, the annual payroll would be $90 million, down from the current $130 million, and purchases in the Johnstown area would be about $4 million, $1 million less than in 1973. The Johnstown plant was very dependent on the Penn-Central Railroad for the transportation of raw materials. In early December, Bethlehem suggested that it was willing to postpone the scheduled closedown of 1.3 million tons of steelmaking capacity at Johnstown if Federal and State environmental agencies would relax their standards at the Johnstown plant.

The corporation at its Bethlehem plant was replacing No. 1 and No. 2 coke-oven batteries and was installing a 100-MMcfd unit supplied by Black, Sivall and Bryson (BS&B), Houston, Tex., to desulfurize coke-oven gas and recover elemental sulfur. The unit, due for completion in 1975, will use a new patented Bethlehem process. Some improvements were made on one blast furnace, and rebuilding of several blast furnace stoves was finished. A 48-inch rolling mill was reconditioned. In February, the BOF shop produced a 260-ton carbon-vanadium steel ingot, the largest ever made, that was converted by Bethlehem's press forge department into a hydroturbine shaft for the Allis-Chalmers Corp. as a part of the power-generating equipment in the Bonneville Power Pool. Early in 1973, Bethlehem announced plans to phase out its steel foundry, in Palmer Township near Allentown, because of the low volume of orders and the high cost of modernization.

Construction of $365,000 pollution-control facilities for a ferromanganese pig easting operation was undertaken at Bethlehem's Johnstown plant. The Johnstown "L" blast furnace produced 4.6 million tons of iron during the life of a single-grade NMA carbon-brick lining installed in the bosh in May 1967. During the tear-out in March it was found that the minimum thickness of the carbon brick in the bosh was 3 inches.

Bethlehem's Steelton plant operated three 150-ton, 22-foot-diameter, 60,000-kva furnaces in its steel-producing shop. The record production in the shop was approximately 110,000 tons in January. The shop produced specialty products, mainly for railroad accessories, from a product mix which was 60% rebar and 40% railroad rail.

The Blaw-Knox Foundry & Mill Machinery, Inc., closed its Union Steel Works at Lawrenceville because of an unfavorable economic outlook. More than 700 persons were employed when the plant was at peak production. The firm also decided not to reopen its Lewis Machine Co., at Groveton.

Carpenter Technology Corp., Reading, was installing electroslag refining (ESR) facilities, electrical coils for No. 4 mill motors and generators, and a Sendzimir cold-rolling mill. A controlled-atmosphere continuous-roller hearth furnace started operation. Work was in progress on air pollution control systems.

The Bakerstown Container Corp. started construction in May at Bakerstown of a $425,000 addition to its plant for recycling and reprocessing 30- and 55-gallon steel drums and containers. The potential capacity of the plant will be increased from about 3,000 to as many as 8,000 drums per week. The payroll will be doubled to 44 persons. The project's cost was financed by arrangements made by the Allegheny County Industrial Development Authority.

The Crucible Stainless Steel Div., Colt Industries, put into commercial operation in March at Midland, a continuous caster built by DeMag AG of Duisberg, West Germany, to handle molten stainless steel previously purified in four AOD, 100-ton-capacity furnaces. The caster eliminated pouring molten steel into ingot molds, stripping ingots from the molds, reheating ingots and rolling them into slabs. Equipment for producing edge-finished stainless strip was transferred to the Midland plant from the firm's phased-out Spaulding plant at Harrison, N.J. Pollution-control systems costing $3.5 million were installed during the year.

Edgewater Corp., Oakmont, completed a dust collection system for a melt shop

and planned the installation of two boring mills for railroad-car wheel production at a cost of $650,000. The firm improved forging facilities at its Latrobe plant and operated a nearby natural gas producing field that supplied about 30% of the plant's requirements.

Jessop Steel Co., Washington, installed a bulk lime storage facility and awarded a turnkey contract to Holley, Kenney, Schott Inc., to engineer and construct a 270,000-cubic-foot-per-minute system for collecting fume and dust from an electric-arc furnace. In November Jessop reported that 100 heats of stainless steel had been processed in an AOD vessel during the life of a single refractory lining.

In March, DER set a March 31, 1974, deadline for abatement of air polution from two coal-fired boilers at Jones & Laughlin Steel Corp.'s (J & L) Aliquippa Works. The DER directive also required J & L to control particulate emissions from a sinter plant by November 30, 1974, and to control air pollution from its coke ovens by May 22, 1975. In late July, J & L agreed to pay a $500 fine for an excessive particulate discharge from an open hearth furnace stack at its Hazelwood plant. In October, the Allegheny County Air Pollution Variance Board refused J & L permission to continue emitting excessive particulate matter from its Hazelwood boiler house. In late May, an estimated 13,000 gallons of sulfuric acid leaked from a tank at the Aliquippa Works into the Ohio River. Lime and caustic soda were dumped into the river to neutralize the acid.

On January 16, J & L announced plans to close the ingot mold foundry at its Pittsburgh Works because a crane in the foundry was limited to handling 10 tons of hot metal, a quantity too small to produce larger molds needed in the firm's revitalization program. In January only one of five blast furnaces in the Pittsburgh Works was active because J & L's policy was to make most of its steel at the Pittsburgh Works by the extensive use of scrap. In 1973, J & L solved some of its coke shortage by the use of Pennsylvania anthracite, which cost less than coke purchased at $50 per ton on the open market.

J & L awarded the Koppers Co. a $53.0 million prime contract for a 56-oven coke battery, to be equipped with the latest equipment, including pipeline charging of coal. When completed in 1975, the new battery will replace two old batteries of ovens, one of which was being dismantled in midyear. In late November 1 million tons per year of L–D capacity was idle at the Aliquippa Works. About 20,000 tons of molten steel production was lost because of a break in an oxygen line.

The Lukens Steel Co. Coatesville, operated an electroslag refining (ESR) facility designed to produce plates up to 12 inches thick, pattern weights up to 36,000 pounds in many widths and lengths, and slabs weighing up to 50,000 pounds and measuring 30 inches thick and 60 inches wide. Lukens produced nuclear quality A533 Grade B steel up to 8 inches thick for use by the Chicago Bridge & Iron Co. in fabricating five rings weighing 1,600 tons total for Philadelphia Electric Co.'s Limerick No. 2 nuclear reactor near Pottstown. Lukens held a minority interest in a plant to be built by Fluidized Iron Ore Reduction (FIOR) in Venezuela for producing prereduced iron ore briquets for use in Luken's electric furnaces as a means of obviating high scrap prices.

In April, Mesta Machine Co., West Homestead, requested a variance until December 31, 1974, from the Allegheny County Air Pollution Control Board for its four-open-hearth shop. Mesta planned to install either a baghouse or an electrostatic precipitator to clean furnace exhaust gases.

Mini-Met Industries Inc., Cleveland, Ohio, planned to start construction of a $28 million ministeel mill at Erie. The mill is designed to produce 205,000 tons of cold-heading wire rod and 40,000 tons of forging-quality billets annually. The schedule planned to have a melt and billet shop completed 1 year after groundbreaking and a rolling mill completed 6 months later. It was expected that the mill would provide 850 jobs in Erie County and more than triple Erie's port traffic.

The National Forge Co., Erie, completed a fume and dust-control system to serve two 75-ton and one 35-ton electric steel furnaces.

In December, National Castings Div., Midland-Ross Corp. announced plans to spend more than $1 million at Sharon for a thermal sand reclamation system to recover about 300 tons per day.

In May, Obenchain Corp., Washington, demonstrated a pilot plant operation for the one step conversion of iron oxide to steel. The process used pellets containing carbon and iron ore or mill scale. Reportedly, carbon in the form of anthracite, petroleum coke, or coke breeze could be used efficiently. About 12,000 tons of the pellets were charged in a blast furnace of McLouth Steel Corp., but the results were not publicized.

Pennsylvania Malleable Iron Div., Gulf and Western Co., spent $4 million on a modernization program at its Landisville plant. Equipment installed included two 10-ton coreless induction furnaces, 250- and 500-pound pouring ladles and monorail systems, 18 jolt-squeeze molding machines, double-deck oscillating pan feeders to separate castings from sand, an automated sand-handling system, and sand storage silos.

Pittsburgh Annealing Box Co. designed and built a corrugated muffle for the bright annealing of strip up to 2,200° F. Reportedly, the 60-foot-long muffle was the largest of its type ever fabricated.

In July, SCM Corp.'s Glidden-Durkee operation in Johnstown started to double its capacity to produce stainless steel and specialty metal powders. The $1.7 million expansion involved the installation of two 4,000-pound electric melting furnaces, water atomization units, screens, heat-treating furnaces, and blending and packaging equipment.

The Tube City Iron & Metal Co., Glassport, and Ag-Met Inc., of Hazleton, on July 11 announced plans to start up in the fall of 1973 at a undisclosed site in Allegheny County a plant capable of fragmentizing 11,000 automobiles monthly to produce 7,500 tons of quality steel scrap.

In January, Sharon Steel Corp., a subsidiary of NVF Co., contracted with Pennsylvania Engineering Corp. (Pecov) for the major portion of the work and equipment required to complete a 150-ton BOF converter shop at Farrel. Sharon planned to use the new furnace for its primary BOF steel production while maintaining existing rotating Kaldo furnaces on a standby basis. Reportedly, the high costs of refractories for the Kaldo furnaces placed Sharon at a competitive disadvantage.

In early September, Sharon announced a major investment in new blast and electric furnaces that will increase its ironmaking capability to 3,100 tons from 2,600 tons per day within 2 years. Sharon's Carpentertown Coal and Coal Div., at Templeton, modernized coke cars and revamped its coal preparation plant.

Shenango announced plans to install, air pollution control equipment costing $3.5 million at its Neville Island plant. The project included coke oven gas desulfurization units and equipment for the recovery of elemental sulfur.

Universal-Cyclops Specialty Steel Div., Cyclops Corp., installed a new 2-high, 4-high blooming mill with two 3,500-hp drives and additional air pollution controls on a 40-ton electric-arc furnace at Bridgeville. New nitric acid pickling equipment was completed at the firm's Pittsburgh plant, and work was completed at Titusville on an additional 30-ton crucible for a vacuum induction-melting furnace, a hot and/or cold shape-rolling mill, and pollution controls for bar pickling equipment.

On September 26, U.S. Steel submitted a plan to the Allegheny County Air Pollution Control Board to install new stage-charging systems on all batteries of ovens at the Clairton Coke Works. Allegheny County officials and DER rejected the plan within a week. EPA reentered the controversy in October after previously stating that Federal authorities were powerless to do anything about the air pollution situation at the Clairton Works. In early November, EPA cited U.S. Steel for 63 violations at the Clairton Works of federally approved air pollution control regulations. The company was given 30 days to clear up the violations. On August 27 the Allegheny County Board denied a variance to continue until July 1975 the release of pollutants from U.S. Steel's sintering plants at the Homestead Works and at the Edgar Thomson Works. The Board granted U.S. Steel a variance until December 1, 1973, to continue operation of its sulfuric acid plant at Neville Island. In early July, U.S. Steel let a contract to M. W. Kellogg, Houston, Tex. to engineer a three-unit desulfurization plant at the Clairton Works, comprising a vacuum carbonate unit, a tail gas desulfurization system, and a unit to remove hydrogen cyanide. A fire in a gas-compressor room at the Clairton Works on September 24 forced U.S. Steel to bleed raw gas from

19 coke batteries as a precautionary measure. The Allegheny County Board did not cite the firm because a brisk wind cleared the smoke from the nearby Monongahela River valley. The Allegheny County Board in early December asked U.S. Steel to submit a plan by January 15, 1974 to control fugitive emissions from BOF shops at the Duquesne section of the Edgar Thomson Works.

On February 6, Commonwealth Court upheld a $2,000 fine against U.S. Steel for discharging untreated wastes into the Monongahela River from the Homestead Works. A broken underground coupling was blamed for a 57,000-gallon fuel-oil spill from U.S. Steel's Duquesne Works on June 1 into the Monongahela River. Clean Water, Inc., a New Jersey firm, operated booms and skimmers to clear the oil from the river, reportedly at a cost between $50,000 and $100,000. On June 19, U.S. Steel arranged financing of several pollution control systems for the Clairton Works at a cost of $32,150,000. The largest project to clean all process water used at the works was financed by a $22.5 million tax-exempt bond issue, issued by the Allegheny County Industrial Development Authority. U.S. Steel arranged to increase an earlier Regional Industrial Development Corp. bond issue to $9,659,000, making possible larger desulfurizing units to remove hydrogen sulfide from coke oven gas by a cryogenic process operated at under minus 200° F. In July, the ore sintering plant at Saxonburg dumped its millionth carload of ore. From June 1958 to July 1973 the plant produced 59 million tons of high-grade sintered ore that was shipped to U.S. Steel's blast furnaces in the Pittsburgh district.

On November 30, FPC ordered Texas Eastern Transmission Co. to restore a full supply of natural gas to U.S. Steel's ammonia plant at Clairton. Earlier Texas Eastern had cut supplies by 46% to the plant, which produced ammonium nitrate for use by strip mine operators and farmers.

No. 22 coke oven battery at U.S. Steel's Clairton Works resumed operation in October following a rebuilding program to reduce the emissions of air pollutants. Stage charging was installed on all of Clairton's coke batteries. Other U.S. Steel facilities completed in 1973 included a casting facility at the Fairless Works in Morrisville, and equipment to produce heavy wall oil-country casing at the Duquesne Works. Also at the Duquesne Works a rodmill was modernized and improvements to the universal plate mill were completed. A medium-size blast furnace was rebuilt at U.S. Steel's National Works in McKeesport.

A 10-count lawsuit by the DER in early 1973 asked that U.S. Steel be fined $2 million for discharging phenol and cyanide into waterways and emitting hundred of tons of air contaminants at its Fairless Works. The company claimed that it had already spent $36 million on controls at Fairless and that complete compliance would cost an additional $50 million to $100 million.

Washington Steel Corp., Washington, planned to invest $18 million for a new mill to roll alloy grades and stainless slabs into coiled sheet for its Sendzimir cold-rolling mills. Tippins Machinery Co., Pittsburgh, was selected to build the mill using roll stands from other mills; Ajax-Magnethermic was to furnish the electric-induction slab heating furnaces; and the Mellon-Stuart Co. contracted to construct the mill building. Completion of the entire project was scheduled for early 1975. The new mill was rated at 250,000 tons annually.

Lead.—Tonolli Co. of Canada, Ltd., constructed a 67,000-square foot plant near Nesquehoning, Carbon County, for lead recycling operations that will provide jobs for 50 to 60 persons. Melting equipment comprised rotary and reverberatory furnaces and kettles.

Molybdenum.—The Blaw Knox Chemical Plants Div., Dravo Corp., in September started the preliminary design of a commercial horizontal lime scrubber for removal of sulfur dioxide at the Langeloth, Pa., molybdenum smelter of the Climax Div., AMAX Corp. The rotating scrubber was developed by the National Lime Association and named after its inventor, C. J. Lewis. Reportedly, the scrubber will cost $3 million to $4 million.

A 3-day strike by 143 workers represented by the United Steelworkers of America (USW) ended August 22 at the Molybdenum Corp. of America's Washington plant following ratification of a 3-year contract. The facility produced ferroalloy products of molybdenum, columbium, tungsten, and rare earths.

Nickel.—The Whittaker Metals Alloy

Div., Whittaker Corp., at Greenville, operated the largest secondary nickel electric furnace in the country to produce pig nickel for the stainless steel industry. The plant's capacity was 1,500 tons per month. Standard pigs contained 35% nickel and 15% chromium; the remainder comprised iron and minor amounts of molybdenum, cobalt, and copper. Carpenter Technology Corp., Reading, installed a Sendzimir cold strip mill to produce nickel alloy strip.

Platinum.—Matthey Bishop Inc., Malvern, continued construction of a plant and equipment to produce catalytic devices to meet the clean air standards imposed for the 1975 automobiles model year.

Rare Earths.—Matthey Bishop, Inc., Malvern, was granted a nonexclusive license by CTS Corporation, Elkhart, Ind., for the manufacture and resale of resistor materials containing ruthenium oxide.

Zinc.—The New Jersey Zinc Co. mined zinc ore near Freidensville averaging 6.7% zinc content. Metallic minerals in the ore were sphalerite and pyrite in a quartz and dolomite gangue. The output of the mine was 2.8% greater than in 1972 and its value was 19.6% greater.

The zinc smelter and electrolytic refinery capacity of New Jersey Zinc Co., Palmerton, was 120,000 short tons per year. The St. Joe Minerals Corp. plant at Monaca had annual zinc capacity of 260,000 short tons.[18]

Two zinc producers in Pennsylvania produced 438,112 short tons of sulfuric acid (100% basis) and consumed 531,430 short tons (100% basis).

The Beaver County Industrial Development Authority offered $22.5 million in revenue bonds to finance air and water pollution abatement facilities at the zinc smelter of St. Joe Minerals Corp., near Monaca. The firm announced plans to expand its zinc smelting facilities at Monaca by 40,000 tons per year of slab zinc equivalent, an increase of 15% over existing capacity.

Zirconium.—The Westinghouse Electric Corp., Blairsville, installed four cold mills to produce Zircaloy tubing in sizes ranging from 0.25 inch to 1.50 inches.

[18] McMahon, A. D., C. H. Cotterill, J. T. Dunham, and W. L. Rice. The U. S. Zinc Industry: A Historical Perspective. BuMines IC 8629, 1974, 76 pp.

Table 29.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
Nonmetallic: Satellite Alloy Corp.	9800 McKnight Road Pittsburgh, Pa. 15237	Plant	Allegheny.
Metallic:			
Abrasive Metals Co	26th & B. & O. RR Pittsburgh, Pa. 15222	do	Do.
Durasteel Abrasive Co	2601 Smallman Street Pittsburgh, Pa. 15222	do	Westmoreland.
Pangborn Div., the Carborundum Co.	Box 380 Hagerstown, Md. 21740	do	Butler.
Cement:			
Allentown Cement, Div., National Gypsum Co.[1]	7th St. at Thruway Allentown, Pa. 18101	do	Berks.
Allentown Cement, Div., National Gypsum Co.	do	do	Montgomery.
Bessemer Cement Co., subsidiary of Louisville Cement Co.	510 Hanna Bldg. Cleveland, Ohio 44115	do	Lawrence.
Coplay Cement Mfg. Co.[1]	North 2nd Street Coplay, Pa. 18037	do	Lehigh.
Do	Easton Road Coplay, Pa. 18037	do	Northampton.
G & W. H. Corson, Inc	Plymouth Meeting, Pa. 19462	do	Montgomery.
Martin Marietta Cement[1]	Box 5618 Baltimore, Md. 21210	do	Northampton.
Green Bag Cement Co., Div., of Marquette Cement Manufacturing Co.	20 North Wacker Drive Chicago, Ill. 60606	do	Allegheny.
Hercules Cement Co., Div. of Amcord Inc.	1770 Bathgate Road Bethlehem, Pa. 18018	do	Northampton.
Keystone Portland Cement Co.[1]	2200 Hamilton Street Allentown, Pa. 18105	do	Do.
Lone Star Industries Inc.[1]	Box 6237 West End Dr. Richmond, Va. 23230	do	Do.

See footnotes at end of table.

Table 29.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Cement—Continued			
Medusa Portland Cement Co.[2]	Box 5668 Cleveland, Ohio 44101	Plant	Lawrence.
Medusa Portland Cement Co.[3 4]	do	do	York.
National Portland Cement Co.[1]	1023 West St. George Ave. Linden, New Jersey 07036	do	Northampton.
Penn-Dixie Cement Corp.[5]	Box 152 Nazareth, Pa. 18064	do	Butler.
Penn-Dixie Cement Corp.[1]	do	do	Northampton.
Universal Atlas Cement Div., U.S. Steel Corp.	600 Grant St. U.S. Steel Bldg. Pittsburgh, Pa. 15230	do	Allegheny.
Universal Atlas Cement Div., U.S. Steel Corp.[1]	do	do	Northampton.
Whitehall Cement Manufacturing Co.[1]	123 South Broad St. Philadelphia, Pa. 19109	do	Lehigh.
Clay and shale:			
Fire:			
Drexel Refractories Div., Drexel Dynamics Corp.	Box 50 Kittanning, Pa. 16201	Underground	Armstrong.
Freeport Brick Co., Kittanning Brick Div.	R.D. 1 Adrian, Pa. 16120	do	Do.
Harbison Walker Refractories.	2 Gateway Center Pittsburgh, Pa. 15222	Pits	Cambria, Centre, Clearfield, Fayette, Somerset.
Clearfield Clay Prod., Co	Box 1110 Clearfield, Pa. 16830	3 mines	Clearfield.
Reese Brothers	Houtzdale, Pa. 16651	2 mines	Do.
Ralph A. Veon, Inc	Darlington, Pa. 16115	Pit	Lawrence.
Common clay and shale:			
Bylite Corp	Box 1628 North End Station Wilkes-Barre, Pa. 18705	Pit	Luzerne.
Darlington Brick and Clay Products Co.[7]	Darlington, Pa. 16115	Mines	Beaver.
Glen-Gery Corp	227 North 5th St. Reading, Pa. 19601	Pit	Berks, Northumberland, Union, York.
Hanley Co	28 Kennedy St. Bradford, Pa. 16701	Pit	McKean, Jefferson.
Marion Brick Corp	341 Mt. Vernon Ave. Marion, Ohio 43302	Mine	Clearfield.
McAvoy Vitrified Brick Co	Phoenixville, Pa. 19460	Pit	Chester.
McQuiston Coal Co.[6]	109 East Moody Ave. New Castle, Pa. 16101	Pit	Lawrence.
Milliken Brick Co., Inc	2100 Montier St. Pittsburgh, Pa. 15221	Pit	Allegheny.
Coal:			
Anthracite:			
Blue Coal Corp.[4]	101 South Main St. Ashley, Pa. 18706	Underground	Luzerne.
Blue Coal Corp.[7]	do	Culm bank	Do.
Blue Coal Corp.[8]	do	Strip	Do.
Gilberton Coal Co	Gilberton, Pa. 17934	Culm bank	Northumberland.
Glen-Nan Coal Co., Inc	St. Mary's and River Rd. Wilkes-Barre, Pa. 18702	Underground	Luzerne.
Greenwood Stripping Corp	1 Venice Street Nesquehoning, Pa. 18240	Strip	Carbon, Schuylkill.
Jeddo-Highland Coal Co.[8]	800 Exeter Ave. West Pittston, Pa. 18643	do	Luzerne.
Jeddo-Highland Coal Co.[4]	do	Culm bank	Do.
Kerris & Helfrick, Inc	Lehigh and Popular St. Mount Carmel, Pa. 18751	Strip	Columbia, Northumberland, Schuylkill.
Leon E. Kocher Coal Co	Box 127 Valley View, Pa. 17983	Underground	Schuylkill.
Lehigh Valley Anthracite, Inc.	800 Exeter Ave. West Pittston, Pa. 18643	Culm bank	Carbon, Schuylkill, Luzerne.
Do	do	Strip	Columbia, Luzerne, Schuylkill.
Reading Anthracite Co	200 Mahantongo St. Pottsville, Pa. 17901	Culm bank	Northumberland, Schuylkill.
Do	do	Strip	Do.

See footnotes at end of table.

Table 29.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Coal—Continued			
Bituminous:			
Barnes & Tucker Co	357 Lancaster Ave. Haverford, Pa. 19041	Underground	Cambria.
Bethlehem Mines Corp	701 East 3rd St. Bethlehem, Pa. 18016	do	Cambria, Washington.
Buckeye Coal Co	Box 900 Youngstown, Ohio 44501	do	Greene.
C & K Coal Co	Box 69 Clarion, Pa. 16214	Strip mine	Clarion.
The Florence Mining Co.[8]	P.O. Box 35 Seward, Pa. 15954	Underground	Indiana.
Gateway Coal Co., for J & K Steel Corp.	Box 608 California, Pa. 15419	do	Do.
Helvetia Coal Co	655 Church St. Indiana, Pa. 15701	do	Do.
Jones & Laughlin Steel Corp.	Box 608 California, Pa. 15419	do	Greene.
Mathies Coal Co	Box 500 Library, Pa. 15129	do	Washington.
Pittsburgh Coal Co.[4]	do	do	Do.
Republic Steel Corp.[4]	P.O. Box 6778 Cleveland, Ohio 44101	do	Allegheny.
Do	do	do	Westmoreland, Washington.
Rochester and Pittsburgh Coal Co.	655 Church St. Indiana, Pa. 15701	do	Armstrong.
United States Steel Corp	525 Wm. Penn Pl. Pittsburgh, Pa. 15219	do	Washington.
Graphite (synthetic):			
Airco Speer Carbon Products, Div., of Air Reduction Co., Inc.	Theresia St. St. Marys, Pa. 15857	Plant	Elk.
Chas., Pfizer & Co., Inc., MPM Division.	235 East 42d St. New York, N.Y. 10017	do	Northampton.
Stackpole Carbon Co	St. Marys, Pa. 15857	do	Elk.
Gypsum (calcined):			
United States Gypsum Co.[9]	101 South Wacker Dr. Chicago, Ill. 60606	do	Philadelphia.
Iron Ore:			
Bethlehem Mines Corp.[1]	701 East 3d St. Bethlehem, Pa. 18016	Underground	Berks.
Bethlehem Mines Corp.[11]	do	do	Lebanon.
Iron oxide pigments:			
Crude:			
Allegheny Ludlum Steel Corp.	2000 Oliver Bldg. Pittsburgh, Pa. 15222	Plant	Allegheny.
Lanzendorfer Minerals Co	Twin Rocks, Pa. 15960	Pit	Cambria.
Finished:			
Minerals, Pigments & Metals Div., Chas. Pfizer & Co., Inc.	640 North 13th St. Easton, Pa. 18042	Plant	Northampton.
The Prince Manufacturing Co.	Bowmanstown, Pa. 18030	do	Carbon.
Reichard-Coulston, Inc	15 East 26th St. New York, N.Y. 10010	do	Northampton.
Lime:			
The J. E. Baker Co.[1]	Box 1189 York, Pa. 17405	do	York.
Mercer Lime & Stone Co	1640 Oliver Bldg. Pittsburgh, Pa. 15222	do	Butler.
National Gypsum Co.[1]	325 Delaware Ave. Buffalo, N.Y. 14202	do	Centre.
Warner Co.[1]	1721 Arch Street Philadelphia, Pa. 19103	do	Centre, Chester.
Peat:			
Benton Peat	Benton, Pa. 17814	Bog	Columbia.
Blue Ridge Industries, Inc	Box 128, R.D. 2 White Haven, Pa. 18661	Bog	Luzerne.
D. M. Boyd Co	226 Francis Street New Wilmington, Pa. 16142	Bog	Lawrence.
Corry Peat Products Co	515 West Columbus Ave. Corry, Pa. 16407	Bog	Erie.
International Peat, Inc	R.D. 1 White Haven, Pa. 18661	Bog	Luzerne.

See footnotes at end of table.

Table 29.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Peat—Continued			
Lake Benton Peat Moss	1418 North Main Street Scranton, Pa. 18508	Bog	Lackawanna.
Pennsylvania Peat Moss, Inc	21st and Laurel Streets Hazleton, Pa. 18201	Bog	Luzerne, Monroe.
Stillers Blue Ridge Peat Co	R.D. 1 White Haven, Pa. 18661	Bog	Luzerne.
Perlite (expanded):			
Armstrong Cork Co	Lancaster, Pa. 17603	Plant	Lancaster.
Pennsylvania Perlite Corp	Box 2002 Lehigh Valley, Pa. 18001	---- do	Lehigh, York.
Petroleum refineries:			
Atlantic Richfield Co	206 South Broad St. Philadelphia, Pa. 19102	---- do	Philadelphia.
BP Oil Corp	600 Fifth Ave. New York, N.Y. 10001	---- do	Delaware.
Gulf Oil Corp	Box 7408 Philadelphia, Pa. 19101	---- do	Erie.
Kendall Refining Co., Div., of Witco Chemical Co.	Bradford, Pa. 16701	---- do	McKean.
Pennzoil United, Inc	Oil City, Pa. 16301	---- do	Venango.
Quaker State Oil Refining Corp	Farmers Valley, Pa. 16749	2 Plants	McKean, Venango.
Sun Oil Co	1608 Walnut Street Philadelphia, Pa. 19101	Plant	Do.
United Refining Co	Warren, Pa. 16365	---- do	Warren.
Valvoline Oil Co., Div., of Ashland Oil and Refining Co.	Freedom, Pa. 15042	---- do	Beaver.
Wolf's Head Oil Refining Co., Inc.	Reno, Pa. 16343	---- do	Venango.
Sand and gravel:			
Alpha Portland Cement Co	Martins Creek, Pa. 18063	Pit and mill	Northampton.
Davison Sand & Gravel Co	34th Ave. and 4th St. New Kensington, Pa. 15068	Dredge	Westmoreland.
Deavo Corp Keystone	One Oliver Plaza Pittsburgh, Pa. 15222	---- do	Beaver.
Erie Sand Steamship Co	Erie, Pa. 16500	---- do	Erie.
Haudaille Constro. Materials Inc.	10 Park Place Morristown, N.J. 07960	Pit	Northampton.
Lycoming Silica Sand Co	401 Broad St. Box 159 Montoursville, Pa. 17754	Pit	Lycoming.
Mahoning Valley Sand Co	Box 1236 New Castle, Pa. 16102	Pit and plant	Lawrence.
Pennsylvania Glass Sand Corp	Berkeley Springs, W. Va. 25411	Pit	Huntingdon, Mifflin, Venango.
Warner Co	1721 Arch St. Philadelphia, Pa. 19103	Pit	Bucks.
Wyoming Sand and Stone Co	Galls, Pa. 18615	Pit	Wyoming.
Smelters:			
The New Jersey Zinc Co	Palmerton, Pa. 18071	Plant	Carbon.
St. Joe Minerals Corp	Josephtown, Pa. 15061	---- do	Beaver.
Stone:			
Limestone and dolomite—crushed:			
Appalachian Stone Div., Martin-Marietta Corp.	Box 120 Mercersburg, Pa. 17236	Quarry	Centre, Chester, Fayette, Franklin.
Bethlehem Mines Corp	701 East 3rd St. Bethlehem, Pa. 18016	---- do	Adams.
Do	---- do	---- do	Mifflin, Montgomery, Northampton.
Bradford Hills Quarries, Inc.	Box 231 Easton, Pa. 18042	---- do	Chester, Lancaster, Perry.
G. & W. H. Corson, Inc.[12]	Plymouth Meeting, Pa. 19462	---- do	Montgomery.
Eureka Stone Quarry, Inc	Lower State and Pickertown Rds. Eureka, Pa. 18914	Quarry	Bucks.
Eastern Industries, Inc	Box 188 Wescosville, Pa. 18090	---- do	Berks, Lehigh.
Lycoming Silica Sand Co	Box 159 Montoursville, Pa. 17754	---- do	Columbia, Lycoming, Montour.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	---- do	Berks, Centre, York.
New Enterprise Stone & Lime.	New Enterprise, Pa. 16664	---- do	Bedford, Blair, Franklin, Huntingdon.

See footnotes at end of table.

Table 29.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued			
Sandstone and quarzite—crushed:			
Coolbaugh Sand & Stone, Inc.	32 Railroad Ave. Scranton, Pa. 18505	Quarry	Luzerne.
Latrobe Construction Co	Box 150 Latrobe, Pa. 15650	Underground	Westmoreland.
Summit Quarries, Div., of J. Robert Bazley, Inc.	Box 298 Pottsville, Pa. 17901	Quarry	Schuylkill.
Sandstone and quartzite—dimension:			
Delaware Quarries	Lumberville, Pa. 18933	do	Bucks.
Media Quarry Co	131 East 2d St. Media, Pa. 19063	do	Delaware.
Slate—dimension:			
Anthony Dally & Sons, Inc	Robinson Ave. Pen Argyl, Pa. 18072	do	Northampton.
Emerald Slate Corp	Alpha Road Wind Gap, Pa. 18091	do	Do.
Penn Big Bed Slate Co., Inc.	446 Main St. Slatington, Pa. 18080	do	Lehigh.
Stephens-Jackson Co	Main St. and Schanck Ave. Pen Argyl, Pa. 18072	do	Northampton.
D. Stoddard & Sons, Inc	Bangor, Pa. 18013	do	Do.
Traprock (basalt)—crushed and broken:			
The General Crushed Stone Co.	712 Drake Bldg. Easton, Pa. 18042	do	Bucks, Delaware.
Warner Co	1721 Arch St. Philadelphia, Pa. 19103	do	Berks.
Granite—crushed:			
Mignatti Construction Co., Inc.	2310 Terwood Ave. Bethayres, Pa. 19006	do	Montgomery.
Sulfur:			
Atlantic Richfield Co	3144 Passyunk Ave. Philadelphia, Pa. 19145	Plant	Philadelphia.
Tripoli (rottenstone):			
Keystone Filler & Manufacturing Co.	Muncy, Pa. 17756	Pit	Lycoming.
Vermiculite (exfoliated):			
Hyzer & Lewellen	Box 155 Southhampton, Pa. 18966	Plant	Bucks.
W. R. Grace & Company, Construction Prod. Div.	62 Whittemore Ave. Cambridge, Mass.	do	Lawrence.

[1] Also limestone.
[2] Also limestone and shale.
[3] Also limestone and clay.
[4] 2 operations.
[5] Also limestone and sand and gravel.
[6] Also fire clay.
[7] 3 operations.
[8] 4 operations.
[9] Also expanded perlite.
[10] Also byproduct cobalt and pyrites.
[11] Also byproduct gold, silver, copper, cobalt, and pyrites.
[12] Also lime.

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